SAN JOAQUIN COUNCIL OF GOVERNMENTS

SJCOG

2022 REGIONAL RESILIENCY IMPLEMENTATION PLAN AND ADAPTATION GUIDANCE

Caltrans

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EXECUTIVE SUMMARY

The San Joaquin Council of Governments (SJCOG) is a Metropolitan Planning Organization (MPO), Regional Transportation Planning Agency (RTPA), and Local Transportation Sales Tax Authority for San Joaquin County. As an MPO and RTPA, SJCOG is interested in addressing regional climate change impacts to the transportation system and supplying its member jurisdictions with resources to adapt to climate change and increase the resilience of the region's transportation infrastructure.

SJCOG completed a Climate Adaptation and Resiliency (or "Phase I Study") to understand how climate change will affect the San Joaquin region, its transportation network, and those that depend on it. Based on future climate projections evaluated in the Phase I study, the region is at risk of experiencing rising temperatures; flooding driven by changing precipitation patterns, fluvial/riverine inflows and, in tidally influenced locations, sea level rise and storm surge; and potentially indirect or direct wildfire impacts.

The Regional Resiliency Implementation Plan and Adaptation Guidance (or "Phase II Study") furthers the Phase I study by providing specific solutions to anticipated transportation impacts such as asset degradation, travel delay, emergency evacuation, and public safety. These "implementation strategies" were collected from community engagement with San Joaquin stakeholders and the public and include physical adaptation strategies such as making levee improvements, but also include a broad range of strategy types such as creating new policies and programs, identifying funding opportunities, capacity building options, and more. They were prioritized based upon factors such as effectiveness, cost, ease of implementation, and co-benefits such as greenhouse gas (GHG) reduction potential and whether the strategy would protect a disadvantaged community, to general identify effective and important strategies for the San Joaquin region. However, this prioritization process reflected SJCOG's priorities and therefore may be different for other regional stakeholders.

The top 20 implementation strategies to build the resilience of the San Joaquin region transportation network and communities are as follows, in order of priority. See the Prioritized Implementation Strategies for the San Joaquin Region section for information on each strategy.

Create a Regional Climate Collaborative

The top San Joaquin region implementation strategy is to develop a regional climate collaborative, which meets regularly to coordinate and implement responses to climate change.

Develop a Regional Emergency Response Plan

A regional emergency response plan could be developed to evaluate existing evacuation and emergency response efforts and identify additional evacuation routes, emergency response strategies (e.g., setting up contraflow lanes), and the roles and responsibilities of stakeholders in the San Joaquin region, including transit operators.

Conduct a flood adaptation assessment for SR-4 from Stockton west to Contra Costa County

The SJCOG Phase I Study identified the most critical and vulnerable assets around the county, including SR-4 from Stockton west to Contra Costa County. This section of SR-4 plays an important role for evacuating the San Joaquin Delta in the event of flooding. However, it operates at a deficient level of service and runs through a 100-year floodplain, and transects tracts projected to be flooded under a one foot of sea level rise (plus storm) scenario. A more detailed assessment of this corridor is recommended to understand future flood risk and potential adaptation strategies. The assessment should also consider how a flood event might impact evacuation routing.

Advance the Lower San Joaquin River Feasibility Study

The Lower San Joaquin River Feasibility Study will identify flood protection needs for the lower San Joaquin River to protect the City of Stockton, where there is existing flood risk, which may be exacerbated with climate change.[1]

[1] US Army Corps of Engineers. Lower San Joaquin River. Accessed February 24, 2022, from https://www.spk.usace.army.mil/lower_sj_river/

Develop climate resilience metrics to evaluate 2022 regional project prioritization

As an MPO, SJCOG is responsible for creating the San Joaquin Regional Transportation Plan (RTP)/Sustainable Communities Strategy (SCS), which includes a list of regional projects to advance the transportation network. As part of this strategy, SJCOG could incorporate a new measure for overall project resilience to climate change, so that adaptive and future-oriented projects would be prioritized. SJCOG has developed a few options for what these resilience metrics could be. See the "Regional Adaptation Resources" section for more information and Appendix E for an analysis of resilience metrics options for the 2022 RTP/SCS.

Conduct a flood adaptation assessment for SR-99 through Lodi

The SJCOG Phase I Study identified SR-99 through Lodi as a priority vulnerability because it is within the 500-year floodplain and serves as a key transportation corridor for the local community and the region. In addition to serving as a bus corridor between Lodi and Stockton, it serves as an evacuation route, which could easily be overwhelmed during an evacuation given already existing congestion during rush hour. A detailed assessment of flood risk is recommended for SR-99 to understand existing and future risks and identify adaptations. The assessment should also consider how a flood event might impact evacuation routing.

Conduct a flood adaptation assessment for South Stockton

The SJCOG Phase I Study identified this area as a priority vulnerability because it has a disproportionally high percentage of transportation-disadvantaged communities compared to the county as a whole and impacts to the transit system will be more acutely felt in South Stockton. A detailed assessment of flood risk and potential evacuation impacts is recommended.

Conduct a flood adaptation assessment for Waterloo Rd/CA-88

The SJCOG Phase I Study identified this area as a vulnerable asset for adaptation action since it serves as an evacuation route. A detailed assessment of flood risk and potential evacuation impacts is recommended to better understand existing and future flood risk and plan flood mitigation and response.

Execute a public education campaign on climate change

This campaign could be used to define climate change terminology such as mitigation, adaptation, and resilience. This could also present an opportunity to share resources on emergency preparedness and evacuation, and to help the public prepare for and effectively respond to flood events and wildfires.

Provide better communication services in emergencies

California has faced numerous natural disasters and emergency events in recent years, including devastating wildfires, landslides, floods, and related impacts such as infrastructure damages. This implementation strategy would involve reviewing the county's existing emergency alert systems and protocols to identify any gaps and ways in which communication could be improved.

Develop back-up power strategies for transit

Transitioning to all-electric buses could be challenging given more frequent power shutoffs; thus, transit providers will need to evaluate back-up power options, such as battery storage and microgrids.

Continue the Mossdale Tract area flood adaptation assessment

The existing levees protecting the SJAFCA Mossdale Tract (Reclamation District 17) Area currently do not provide 200-year flood protection and are not in accordance with Senate Bill 5 and the Urban Level of Flood Protection. Implementing flood risk reduction measures provides necessary protection for new development and existing property that is currently located in the floodplain.

Provide comprehensive back-up power at Port of Stockton

This strategy involves identifying additional back-up power options for the Port so that all areas and systems could remain operational during an outage.

Update design criteria and guidance for infrastructure projects to address climate change

Design criteria and guidance is based on historical climate conditions and events. Adjusting design criteria and guidance is a cost- and time-saving way to account for future climate projections in design and create more resilient infrastructure.

Assess flood mitigation options for City of Stockton public housing

There may be additional flood mitigation measures that can be taken by the City and its Housing Division to ensure Stockton public housing is protected in the event of a flood. Implementing this strategy would involve reviewing the structures on the Restricted Income Housing List and identifying where additional protection may be needed.

Identify dedicated funding sources for climate change adaptation

A lack of funding was one of the most frequently cited barriers to climate adaptation noted by stakeholders interviewed. This implementation strategy could involve collecting all climate resilience competitive funding sources and evaluating opportunities for dedicated funding in San Joaquin County.

Advance the Smith Canal project

The Smith Canal Gate Project is currently under construction until November 2022. This project includes a floodwall along the San Joaquin River and ties into the existing FEMA accredited levee.

Conduct a Stockton Wye flood adaptation assessment

The SJCOG Phase I Study identified this area as a priority vulnerability since it serves as an important freight rail junction between Union Pacific (UP) and BNSF, and new projects are underway to grade-separate the tracks. Disruption to this intersection would have significant impacts to goods movements, including to and from the Port of Stockton, so further study is recommended to determine adaptation measures that could reduce the severity of these impacts.

Conduct a BNSF Intermodal Railyard flood adaptation assessment

The SJCOG Phase I Study identified the most critical and vulnerable assets around the county, including the BNSF Intermodal Railyard. Interruptions at this facility would have major economic consequences and disrupt critical supply chains. Further study is recommended to identify consequences and adaptation options.

Create a free shade tree program

One of the simplest ways to mitigate high temperatures and Urban Heat Island (UHI) is through planting shade trees. This strategy would involve creating a free shade tree program with dedicated funding through regional partnerships.

Each of these strategies and the others contained in the full list of strategies (Appendix A) presents one step towards creating a resilient multi-modal transportation network in the San Joaquin area through regional partnership. This plan is provided not only as a framework for how to achieve a more resilient San Joaquin region, but also to provide SJCOG member jurisdictions and its stakeholders with guidance for how to implement their own climate change vulnerability assessments and adaptation projects.

SJCOG developed a suite of tools and resources to supply stakeholders with adaptation guidance. See the Regional Adaptation Guidance section and Appendix C, D, E, and F for some of these resources, which include:

- Options for creating a Regional Climate Collaborative to foster communication between San Joaquin stakeholders and to work together to advance the strategies of this plan.

- Template language for general plan safety elements, which detail San Joaquin County climate change vulnerabilities, as well as adaptation goals and responses, as collected by SJCOG (these may differ from other stakeholder and jurisdiction goals).
- Climate resilience metrics for use in project evaluation and prioritization, to ensure that projects advanced in the region will be prepared for climate change and avoid impacts.
- A project manager climate change checklist, to help project managers consider how climate change may affect project design and future operations and maintenance.

Finally, SJCOG developed a Regional Resilience Web Portal complimentary to this plan, which provides climate change tools, research, guidance, and grant funding opportunities, to help member jurisdictions and other stakeholders with their own climate change projects. The web portal is accessible here: sjcogresilience2022.com

INTRODUCTION

The San Joaquin Council of Governments (SJCOG) is a Metropolitan Planning Organization (MPO), Regional Transportation Planning Agency (RTPA), and Local Transportation Sales Tax Authority for San Joaquin County. SJCOG is made up of the following member jurisdictions: San Joaquin County and the cities of Stockton, Lodi, Manteca, Tracy, Ripon, Escalon, and Lathrop.[2] As an MPO and RTPA, SJCOG is interested in addressing regional climate change impacts to the transportation system and supplying its member jurisdictions with resources to adapt to climate change and increase the resilience of the region's transportation infrastructure. SJCOG is also dedicated to protecting community safety, especially during emergencies and evacuation events, and prioritizing the needs of San Joaquin County's disadvantaged and underserved communities.

SJCOG completed a Climate Adaptation and Resiliency (or "Phase I Study") to begin to understand how climate change will affect the San Joaquin region, its transportation network, and those that depend on it. Based on future climate projections evaluated in the Phase I study, the region is at risk of experiencing rising temperatures; flooding driven by changing precipitation patterns, fluvial/riverine inflows and, in tidally influenced locations, sea level rise and storm surge; and potentially indirect or direct wildfire impacts. Current and future conditions can directly affect transportation systems and assets owned by jurisdictions in the San Joaquin region, and both directly and indirectly affect transportation users. See the "Climate Adaptation and Resiliency (Phase I) Study" section for a complete summary of this study and its findings.

The Regional Resiliency Implementation Plan and Adaptation Guidance (or "Phase II Study") furthers the strategies of the Phase I study by providing specific solutions to anticipated transportation impacts such as asset degradation, travel delay, emergency evacuation, and public safety. This work involved first developing an assessment of regional needs, concerns, and barriers that the public and stakeholders have surrounding climate adaptation. Perhaps the most important aspect of this Phase II Study was the collection of strategies for the San Joaquin region, which can be taken to create a more resilient transportation network into the future. These "implementation strategies" were collected from community engagement with San Joaquin stakeholders and the public and were prioritized based upon factors such as effectiveness, cost, ease of implementation, and co-benefits such as GHG reduction potential and whether the strategy would protect a disadvantaged community. They include physical adaptation strategies such as making levee improvements, but also include a broad range of strategy types such as creating new policies and programs, identifying funding opportunities, capacity building options, and more.

This report focuses primarily on the implementation strategies compiled and developed through the SJCOG Phase II Study, which can be advanced in the San Joaquin region to promote transportation infrastructure resilience, reduce the physical risks of climate change, build capacity of regional stakeholders and communities to adapt to climate change, and preserve public health and safety.

STRUCTURE OF THE PLAN

The Regional Resiliency Implementation Plan and Adaptation Guidance report is intended to be a tool for SJCOG member jurisdictions, other stakeholders, and the public in identifying strategies to adapt to climate change and improve regional resiliency. The plan provides a range of implementation strategies for the region, which can be advanced by SJCOG and its stakeholders. The plan also summarizes the steps SJCOG has taken to develop this list of regional implementation strategies, including the completion of the Phase I Study, stakeholder and public outreach, and the creation of a scoring methodology to rank and compare different strategies. SJCOG member jurisdictions and other stakeholders may find the Regional Adaptation Guidance section particularly useful, as it provides guidance on general principles for adapting to climate change along with specific resources SJCOG has developed for the San Joaquin region.

The plan is divided into the following sections:

- Climate Adaptation and Resiliency (Phase I) Study: Summarizes SJCOG's Phase I Study, which identified planning gaps, climate hazards and projections, and key transportation infrastructure vulnerabilities to climate change.

[2] San Joaquin Council of Governments. (n.d.) About SJCOG. Accessed on February 24, 2022, from https://www.sjcog.org/145/About

- Regional Needs Assessment: Summarizes stakeholder and community engagement conducted for the Phase II Study and the key findings from this engagement, including regional concerns and barriers to addressing climate change, and ideas for adapting to climate change.
- Prioritized Implementation Strategies for the San Joaquin Region: Summarizes the top ranked regional implementation strategies and how the ranking was done.
- Regional Adaptation Guidance: Summarizes general principles for considering climate change projections and uncertainties in decision-making and how to approach climate change adaptation, along with regional adaptation resources for member jurisdictions and other stakeholders.

CLIMATE ADAPTATION AND RESILIENCY (PHASE I) STUDY

In 2020, SJCOG conducted a Climate Adaptation and Resiliency Study to identify critical transportation infrastructure assets within San Joaquin County and assess their existing and future vulnerability to climate change impacts. Existing climate change planning efforts were incorporated to provide more holistic understanding of risks in the area and to allow for prioritization of assets for resilience efforts. The goals of this project were to sustain multi-modal transportation, create and maintain network redundancy, and improve overall resiliency and reliability of San Joaquin County's transportation system. These goals and the approach to the vulnerability assessment were developed alongside a working group of regional stakeholders.

ASSESSMENT APPROACH

The approach to the Climate Adaptation and Resiliency study followed the steps below:

1. The study team collaborated to develop key resiliency goals that focused on improvements to the transportation system. Identification of goals helped to focus the study's scope and prioritize project outcomes and deliverables.
2. The study team conducted a vulnerability assessment that utilized GHG emission projections (RCP 4.5 and RCP 8.5), climate data, and information on relevant transportation assets. The data was used to determine future climate impacts on selected transportation assets and flag high vulnerability assets.
3. The study team used a planning horizon to the year 2050 to synchronize the timeline with RTP and other local efforts.
4. The study team then assessed the vulnerability of assets in relation to identified climate vulnerabilities. Key assets included bus routes, transportation support/maintenance services, goods movement connectors, access points for transportation-disadvantaged populations, evacuation routes, and air and deep-water transport.
5. A criticality assessment was conducted to focus on transportation most important to proper transportation network functioning.
6. A vulnerability assessment was conducted to determine which assets will be most vulnerable (defined to include exposure, sensitivity, adaptive capacity, and consequence) to climate change impacts and to quantify potential disruption. Findings were compared to project resilience goals to prioritize assets according to vulnerability.

CLIMATE HAZARDS

Key climate hazards assessed in the vulnerability assessment included increases in sea level rise, fluvial/riverine inflows, extreme precipitation events, wildfire, and extreme heat.

Overall, San Joaquin County is predicted to experience more flooding due to sea level rise and riverine flooding. This can significantly impact bridge infrastructure by reducing clearing (or "freeboard") and undermining bridge structures. Flooding can also overwhelm drainage systems, damaging rails, roads, and airport infrastructure. Additional improvements need to be made to San Joaquin County levees to protect against sudden flooding events. As a key example, Stockton Airport is located within the 100-year floodplain and may experience significant flight delays and cancellations from flood events.

San Joaquin County is also projected to experience increased frequency and intensity of precipitation events. This can contribute to flooding and flash flooding which can overwhelm drainage systems and exacerbate the effects of sea level rise and riverine flooding.

Wildfires are projected to remain consistent or even slightly decrease in frequency across San Joaquin County. However, wildfires may still impact transportation infrastructure by causing closures that may exacerbate congestion and restrict access to transportation from other climate impacts.

San Joaquin County is projected to experience a significant increase in the number of hot days which can place strain on rail infrastructure, roads, runways, and maintenance activities by straining the health of maintenance workers.

Lastly, drought and the potential of a mega-drought are predicted to increase in California. Drought can cause roadway pavements to crack and can increase the likelihood of wildfires.

SAN JOAQUIN REGION VULNERABILITIES

Results of the study show the widespread impact of selected climate stressors that make it difficult to identify top priority assets in some cases. The most critical assets in the San Joaquin region were identified through the criticality assessments based on multimodal transportation, redundant routes, and emergency response. In the vulnerability assessment, the project team then evaluated how these assets are projected to be affected by each climate stressor of concern in the San Joaquin region. The top priority assets for adaptation responses are summarized in Table 1 below.

Table 1: Top Priority, Vulnerable Assets in the San Joaquin Region

TOP PRIORITIES	ADDITIONAL PRIORITIES
SR 99 through Lodi	Port of Stockton
South Stockton Neighborhood	I-5 between Tracy and Lathrop
Stockton Airport	Waterloo Road/CA 88
Stockton Wye	Bus stops in downtown Stockton, Hammer Triangle, and Harrell Park
SR 4 from Stockton west to Contra Costa	
BNSF Intermodal Railyard	

REGIONAL NEEDS ASSESSMENT

A thorough inventory of stakeholder and community needs was a critical input into establishing a Regional Resiliency Implementation Plan and Adaptation Guidance for the San Joaquin County's transportation system. The Regional Needs Assessment documents this inventory, summarizing input and findings from a stakeholder workshop, a series of stakeholder interviews, and a public survey conducted for the SJCOG Regional Resiliency Implementation Plan and Adaptation Guidance project.

This Needs Assessment drew on engagement with stakeholders through roughly a dozen interviews and a workshop, and with community members via a public survey. The survey targeted zip codes in disadvantaged communities, as identified by CalEnviroScreen. Over two thirds of respondents resided in these areas.

STAKEHOLDER AND COMMUNITY ENGAGEMENT

STAKEHOLDER ENGAGEMENT

To collect feedback on regional needs, impacts, and adaptation and implementation strategy ideas from SJCOG stakeholders, the project team organized a Vulnerability Assessment Working Group (VAWG) made up of SJCOG's member jurisdictions, regional

nonprofits, transportation agencies, and relevant state agencies. A workshop was held with the VAWG to discuss project goals and outcomes and begin to collect feedback for this Regional Needs Assessment. The project team also held a series of follow up stakeholder group interviews with VAWG members and other regional contacts. The stakeholder interviews provided another opportunity to ask questions posed to the VAWG and gather input from regional decision-makers about some of the most important and vulnerable facilities on the transportation network, and their ideas for how to improve these facilities and make them more resilient.

VAWG WORKSHOP # 1

At the Phase II Study's first workshop, the project team asked questions aimed towards identifying technical, institutional, and community needs and held a discussion with VAWG members. The project team also developed questions and talking points for a second stage of discussion focused on the Phase I Study priority facilities identified in the assessment.

Through discussion with the VAWG, the project team identified needs and barriers to regional adaptation planning and implementation. These needs include specific impacts stakeholders are facing and/or problem areas on the multi-modal transportation network that should be prioritized for the Regional Implementation Strategy.

The VAWG also provided the project team valuable insight into what implementation and adaptation strategies are needed to prepare local communities and the transportation network for a changing climate.

STAKEHOLDER INTERVIEWS

Interviews were held with regional decision makers and asset manager representatives from SJCOG's member jurisdictions, community and faith-based organizations (CBOs/FBOs), VAWG members, and other partner agencies. To maximize the number of interviewees and encourage cross-jurisdictional/agency discussion, the project team organized group interviews with stakeholders that had similar perspectives and interests. Interview questions were developed specific to each set of stakeholders but were focused on achieving the overall stakeholder engagement goals of identifying needs and barriers to regional adaptation planning and implementation, past impacts and problem areas, and adaptation and implementation strategy ideas.

COMMUNITY ENGAGEMENT

Community engagement was an important element during the outreach phase of the SJCOG Regional Resiliency Implementation Plan and Adaptation Guidance project. The engagement process gave community members the opportunity to provide their needs and priorities related to climate change, and detail what climate hazards already impact their daily lives**.** The input received from the community provided the project team with additional information about local concerns surrounding climate change, how residents use the transportation system, how previous weather events have affected them, and the types of responses that the community would like to see implemented in the San Joaquin County region.

With the ongoing COVID-19 health crisis, it was important to develop effective engagement strategies that could be completed in environments that would keep participants safe, while still providing the valuable input needed to meet the project's established community engagement goals. Therefore, the project team researched and identified multiple engagement strategies as alternatives to in-person events or gatherings. It was decided that the engagement strategies that would be most effective during the project's public outreach phase would include the use of an online survey, a dedicated phone line to receive comments from the public, and a social media campaign. Once implemented, all these outreach strategies were made available to the public in both English and Spanish.

The project's online survey was hosted on MetroQuest, a survey platform accessible on both computers and mobile devices (e.g., cellphones and tablets). The SJCOG Regional Resiliency Implementation Plan and Adaptation Guidance online survey was made available to the public on December 24, 2020 and was live through March 15, 2021. During this time, a total of 74 completed surveys were submitted by participants throughout San Joaquin County. The survey consisted of a series of multiple choice and priority ranking questions, as well as a mapping element, and was available to survey participants in both English and Spanish.

The project team also established a dedicated phone line to receive input from the public to help bridge the digital divide that exists among those in the community who have limited or no access to computers and the internet. The phone line consisted of a local number that callers could dial in to and leave a comment on the project or participate in a telephone survey. The telephone survey contained pre-recorded questions that were like the online survey, and that allowed participants to verbally record their answers.

A social media campaign was used to bring awareness to the project and help boost online and phone line survey participation. A targeted social media advertisement via Facebook advertisements was used to ensure input was received from all segments of the community. The project team ran two bilingual Facebook advertisements during the social media campaign. The first advertisement specifically targeted zip codes that are identified by CalEnviroScreen as disadvantaged communities, per California Senate Bill 535. These zip codes were targeted to encourage input from communities that are historically disadvantaged and disproportionately burdened by pollution and environmental impacts. The second advertisement targeted the San Joaquin County region, including those disadvantaged communities already being targeted in the first advertisement.

Additional public outreach strategies that were used during the project's engagement process included sharing project and survey information to project stakeholders for dissemination to their colleagues and constituents, as well as posting project information and the online survey link to the Stockton Reddit platform.

COMMUNITY AND STAKEHOLDER ENGAGEMENT KEY FINDINGS

In general, regional stakeholders face future climate risks with limited funding, staffing, and information about how best to manage these risks. Clearer coordination across stakeholder groups and governments is needed to respond to climate change. There are varying levels of engagement – federal, state, regional, and local – and it can be unclear how all are working together. Cross-agency coordination is needed and should be proactive before there are impacts and emergencies.

Flooding is a persistent threat, particularly in the western portions of the county in the Delta; and in Stockton, by far the most populous city in the county, and nearby communities, such as Lathrop and Manteca. While there is a complex network of flood protection systems, bolstering these levees and other infrastructure to withstand expected future flooding would be very costly. While some jurisdictions and agencies know which parts of their systems are most vulnerable, others lack that knowledge. From a transportation perspective, protecting evacuation routes and infrastructure serving disadvantaged communities are two key priorities. Several key roads, railways and bridges mentioned by stakeholders should be prioritized for adaptations.

Over 90% of community members surveyed said they were very or somewhat concerned about the impacts of climate change, citing poor air quality as the most concerning hazard, followed closely by wildfire and flooding. Poor air quality has impacted travel of far more survey respondents than any of the other hazards (see Figure 1). Many respondents said they experienced poor air quality in the Stockton area.

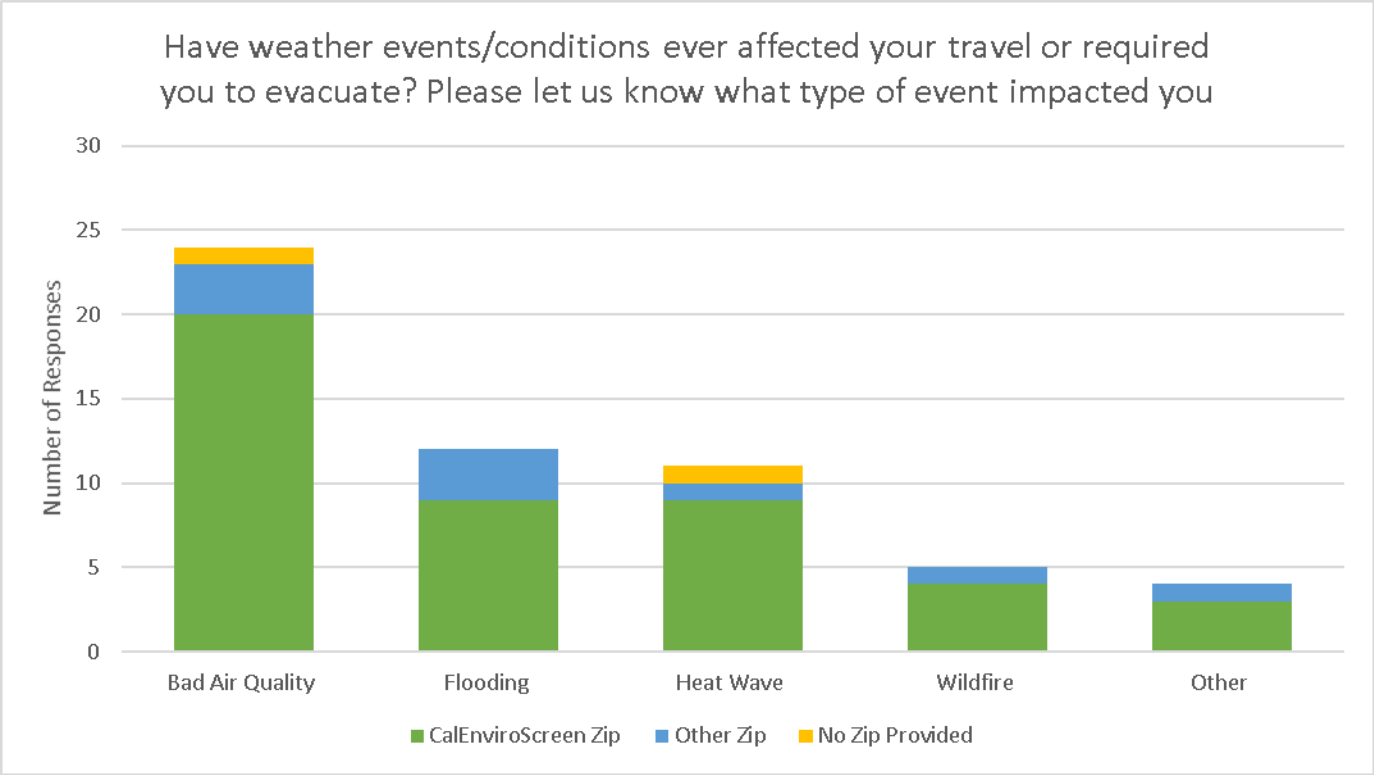

Figure 1: Survey Responses Regarding Past Events and Conditions

According to survey respondents, the most popular transportation strategies for resilience are more trees along roads, expanded bus routes and hours, and more comfortable, shaded transit stops. Each of these strategies tends to be implementable at a local level. When asked about other types of strategies, respondents most frequently cited educational opportunities for community members to learn about climate change and sustainability, followed by community solar or gardens and job training in green business. Public education and accessibility to information were mentioned as key strategies by some stakeholders as well.

Stakeholders and community members also noted poor reliability of electricity in the hottest months of the year. Transitioning to all-electric buses could be challenging given more frequent power shutoffs.

Integrating climate change considerations into the early stages of the transportation planning process should be a priority. Organizations like the Delta Stewardship Council, Caltrans, and California Department of Water Resources are heavily connected to many decisions affecting the resiliency of the region's transportation system, again pointing to the need for collaboration. Many decisions and solutions rest with local agencies as well, where capacity building is particularly important. Local agencies pointed to a need for better guidance on resiliency-related best practices, land use and general planning, and data to support adaption planning and decision making.

PRIORITIZED IMPLEMENTATION STRATEGIES FOR THE SAN JOAQUIN REGION

The conversations held with stakeholders and the public survey responses collected through the Regional Needs Assessment provided an initial set of implementation strategy ideas and established needs and goals for increasing regional resiliency. SJCOG added to this list of strategies to develop 56 implementation strategies total, which was narrowed down to 46 in the final list. The implementation strategies were compiled and ranked in a "Strategy Evaluation Matrix;" a simplified version of this matrix with all implementation strategies is in Appendix A.

To identify the highest priority strategies for implementation in the region, SJCOG developed a system to compare and rank the various strategies. To compare the effectiveness and value of different strategies, a set of consistent criteria were developed to score strategies against one another. These criteria center around the implementation strategy benefits (e.g., risk reduction) and any challenges to implementation (e.g., cost), and are weighted by their relative importance, so that SJCOG and its stakeholders can make informed decisions about which strategies to prioritize.

However, it is important to note that the evaluation criteria, prioritization methodology, and scoring system were defined by SJCOG with input from its stakeholders to create scores that are only relative to the other strategies in the Strategy Evaluation Matrix. It is also important to note that it can be challenging to fairly score so many different types of strategies against one another. For example, one strategy may be very well-defined (e.g., levee improvement project) whereas a different strategy is a high-level concept for a program (e.g., free transit to cooling centers). The effectiveness of the well-defined strategy is better understood, so therefore it may by default receive a higher score. Finally, implementation strategy priorities may vary greatly for different agencies and local jurisdictions. For these reasons, the prioritization scores are provided to help narrow down the long list of strategies to help SJCOG and its members and stakeholders focus resources and attention, but it is not intended to provide rigid framework for completing these strategies.

The implementation strategy prioritization approach is summarized below. See Appendix C for a complete technical memorandum on the prioritization process.

STRATEGY PRIORITIZATION

IMPLEMENTATION STRATEGY EVALUATION CRITERIA

These criteria were used to evaluate the implementation strategies and support strategy prioritization for the San Joaquin region:

- Alignment with Phase I Study:
    - Addresses vulnerabilities at a Phase I priority facility/location (e.g., South Stockton, Stockton Airport, SR 4 from Stockton West to Contra Costa).
    - Addresses vulnerabilities for a critical transportation asset, as defined in the Phase I study using critical asset criteria developed for the study:
        - Bus route density
        - Key supporting services
        - Goods movement connectors
        - Access points for transportation-disadvantaged, rural populations
        - Access to transit for transportation-disadvantaged, urban populations
        - Evacuation routes operating at a low level of service
        - Transport via deep-water port and air
- Effectiveness:
    - Physical risk reduction OR resilience capacity building:
        - Physical risk reduction is evaluated as a criterion for projects that would make a physical improvement to the transportation network or address a site-specific vulnerability. For example, raising or improving a levee would reduce the risk of flooding.
        - Resilience capacity building is evaluated as a criterion for policy-level strategies, or those that would have a broader impact to help the San Joaquin region prepare for climate impacts. For example,

instituting a new tax to fund levee improvement projects would help build capacity needed to mitigate flood risk.

- Relative cost of implementation:
    - Capital cost, or upfront costs of completing a project (e.g., high cost)
    - Operations and maintenance (O&M) cost (including staffing requirements) (e.g., low cost)
- Streamlining implementation:
    - Ease of local implementation (by local/regional entities)
    - Timeframe for implementation (e.g., near, mid, or long term)
    - Alignment with existing projects and funding
- Co-benefits:
    - GHG reductions
    - Local environmental benefits (e.g., improved regional air quality, water quality, habitat)
    - Community health and safety benefits (e.g., to public health, safety, Urban Heat Island mitigation)
    - Disadvantaged community needs and benefits (e.g., to health and safety, improved mobility, and access to transportation options)
    - Improvements to transportation system (e.g., efficiency, redundancy, access, transit/active transportation options)

While not a criterion used in prioritization, the Strategy Evaluation Matrix also notes *who* could be responsible for implementation of each strategy. This could be SJCOG, one of its member jurisdictions, or other regional stakeholders such as the Stockton Metropolitan Airport or the San Joaquin Area Flood Control Agency.

SCORING METHODOLOGY

This information feeds into a weighted criterion scoring methodology. Each implementation strategy is evaluated against the consistent set of criteria provided above. Each strategy receives a score for each criterion. For example, each strategy is assigned a score of low, medium, or high for the "ease of implementation" criterion. These low, medium, and high scores are scaled between 0%, 50%, and 100%, respectively. So, a strategy that is very easy to implement would receive a full scaled score of 100%.

Each criterion also has a weight tied to it based upon SJCOG's priorities. Criteria with higher weights are considered relatively more important. The weights are given as percentages and the sum of all these weights adds up to 100%.

These weights are multiplied by the scaled scores. Then, they are added together to obtain an overall score. This score can then be used to rank each strategy.

The steps to the scoring methodology are provided in more detail below:

1. **Identify common scoring formats and scale for implementation strategy criteria:** There are different ways to measure the evaluation strategy criteria identified above (e.g., dollars, periods of time), which needed to be compared on a common scale for the sake of the scoring exercise. For this project, the project team used simple, categorical scores, particularly given the range of different strategy types being compared. The project team identified scoring formats for each implementation strategy criterion and a common scale for ranking strategies.

   The scoring formats were used to compare and score criteria across different strategies in a simple way. For example, when evaluating the timeframe for implementation a "near, mid, or long-term" scoring format was used. This is compared against

the same criterion for other strategies and can be scored rather simply; a strategy that can be implemented in the "near-term" will receive a higher score than one with a "long-term" timeframe for implementation.

The project team decided to use a simple 0%, 50%, or 100% scale for each of the criteria. For criteria that have a simple "yes or no" scoring format, the associated score is 100% or 0%. For criteria with "low to high" scoring format, the associated scores would be 0%, 50%, to 100%.

2. **Apply weights:** Some criteria were identified as more important than others for determining overall priorities. Therefore, the relative importance of each scaled score was adjusted by multiplying the score by a weighting factor. Criteria deemed more important to prioritization were multiplied by a larger weight (e.g., a 30% weight is more important than a 5% weight). See Table 2 for the evaluation criteria weights.
3. **Calculate prioritization scores for each strategy:** After the weights were applied, the final step was to calculate prioritization scores for each implementation strategy. This was accomplished by first summing the products of the weights and scores for all the criteria relevant to the strategy. The final values were scaled on a range from 0% to 100%, with 0% representing the lowest priority strategy and 100% the highest priority strategy. So, each strategy received a final score out of 100% which was used to compare strategies to one another.
4. **Organize.** The final step was to sort the matrix by overall priority. Each strategy received an associated ranking with its score (1 through 46). The project team created two final strategy rankings: one that ranked all implementation strategies and one that only ranked the near-term, easy to implement strategies.

Table 7 in Appendix A provides a condensed version of the Strategy Evaluation Matrix, showing scores for the following criteria: effectiveness, capital cost, operations and maintenance cost, ease of local implementation, timeframe for implementation, and all co-benefits (GHG reductions, local environmental benefits, community health and safety benefits, disadvantaged community needs and benefits, and improvements to the transportation system). Table 7 also shows the final strategy ranks based upon the criteria scores and final weighting.

Table 2: Evaluation Criteria Assigned Weights

Evaluation Criteria	Weight
Addresses vulnerabilities at a Phase I priority facility/location	4%
Addresses vulnerabilities for a Phase I critical transportation asset	4%
Effectiveness (Physical risk reduction OR resilience capacity building)	50%
Capital cost (upfront costs of completing a project)	5%
Operations and maintenance (O&M) cost (including staffing requirements)	5%
Ease of local implementation (by local/regional entities)	5%
Timeframe for implementation (near, mid, or long term)	5%
Alignment with existing projects and funding	2%
GHG reductions	3.5%
Local environmental benefits (e.g., improved regional air quality, water quality, habitat)	3.5%
Community health and safety benefits (e.g., to public health, safety, Urban Heat Island mitigation)	3.5%
Disadvantaged community benefits (e.g., to health and safety, improved mobility, and access to transportation options)	6%
Improvements to transportation system (e.g., efficiency, redundancy, access, transit/active transportation options)	3.5%

TOP IMPLEMENTATION STRATEGIES

The following section summarizes the top 20 implementation strategies identified for the region, based upon the prioritization analysis. These strategies were found to be the most effective in reducing climate change risks and building capacity to address climate change in the San Joaquin region, the most beneficial based upon their co-benefits, and the easiest to implement based upon cost and other factors. See Table 3 for the top 20 regional implementation strategies. Note that some of the strategies received the same overall score and are therefore ranked the same. The section following Table 3 provides brief summaries of each of the top 20 implementation strategies.

Table 3: Top 20 Regional Implementation Strategies

ID	Strategy	Effectiveness	Capital Cost	O&M Cost	Ease of local implementation	Timeframe for implementation	GHG reductions	Local environmental benefits	Community health and safety benefits	Disadvantaged community benefits	Improvements to transportation system	Score[3]
31	Create a Regional Climate Collaborative or committee to coordinate and implement responses to climate change. Cross-sector collaboration including public health, community-based organizations (CBOs), Climate Action Corps, and private sector.	High	Low	Low	High	Near-term	Yes	Yes	Yes	Yes	No	87%
55	Develop a Regional Emergency Response Plan which integrates the region's transit operators and their role in a mass evacuation event.	High	Medium	Low	Medium	Near-term	No	No	Yes	Yes	Yes	84%
53	Conduct a flood adaptation assessment for SR-4 from Stockton west to Contra Costa County flood, considerate of evacuation planning.	High	High	Medium	Medium	Medium-term	No	No	Yes	Yes	Yes	81%
22	Continue critical projects in progress by the San Joaquin Area Flood Control Agency (SJAFCA). Advance the Lower San Joaquin River Feasibility Study.	High	High	High	High	Near-term	No	No	Yes	Yes	No	80%
45	Develop climate resilience metrics to evaluate 2022 RTP/SCS project list and overall prioritization.	High	Low	Low	High	Near-term	No	No	Yes	No	Yes	79%

[3] The final score is provided out of 100% (best possible).

ID	Strategy	Effectiveness	Capital Cost	O&M Cost	Ease of local implementation	Timeframe for implementation	GHG reductions	Local environmental benefits	Community health and safety benefits	Disadvantaged community benefits	Improvements to transportation system	Score[3]
50	Conduct a flood adaptation assessment for SR-99 through Lodi, considerate of evacuation planning.	High	High	Medium	Medium	Medium-term	No	No	Yes	Yes	Yes	79%
51	Conduct a flood adaptation assessment for South Stockton including roads, transit stops, and rail.	High	High	Medium	Medium	Medium-term	No	No	Yes	Yes	Yes	79%
49	Conduct a flood adaptation assessment for Waterloo Road/CA-88, considerate of evacuation planning.	High	High	Medium	Medium	Medium-term	No	No	Yes	Yes	Yes	79%
32	Execute a public education campaign to ensure that the broader public understands climate change projections, impacts, and adaptation strategies, and the terminology surrounding these topics. There have been good efforts through the Office of Emergency Services to list information on their website about potential risks. This could be taken a step further with public campaigns or explicit partnerships with organizations. The public education campaign should include information about evacuation prep, the act of evacuating, and returning home.	High	Low	Low	High	Medium-term	No	No	Yes	Yes	No	77%

ID	Strategy	Effectiveness	Capital Cost	O&M Cost	Ease of local implementation	Timeframe for implementation	GHG reductions	Local environmental benefits	Community health and safety benefits	Disadvantaged community benefits	Improvements to transportation system	Score[3]
11	Provide better communication services in emergencies. Communications should be offered in multiple languages and formats (e.g., social media, text alerts, phone calls).	High	Low	Low	Medium	Medium-term	No	No	Yes	Yes	No	77%
37	Develop back up power strategies to ensure that electric transit can still provide regular service or assist in evacuation when there are outages.	High	Medium	Medium	High	Long-term	No	No	Yes	Yes	Yes	75%
21	Continue SJAFCA Mossdale Tract (Reclamation District 17) area adaptation assessment (SJAFCA and DWR already evaluating options). Flooding here could affect I-5, I-205 and potentially SR-120. Includes portions of Lathrop, Manteca, Stockton, and San Joaquin County.	High	High	High	Medium	Medium-term	No	No	Yes	Yes	No	75%
48	Provide comprehensive backup power at Port of Stockton during outages.	High	Medium	High	High	Near-term	No	No	No	No	Yes	74%
17	Update design criteria and guidance for infrastructure projects to address climate change. Including Caltrans Highway Design Manual.	High	Low	Low	High	Near-term	No	No	No	No	Yes	74%
40	Assess flood mitigation for City of Stockton public housing in floodplain.	High	Medium	Medium	Medium	Medium-term	No	No	Yes	Yes	No	74%

ID	Strategy	Effectiveness	Capital Cost	O&M Cost	Ease of local implementation	Timeframe for implementation	GHG reductions	Local environmental benefits	Community health and safety benefits	Disadvantaged community benefits	Improvements to transportation system	Score[3]
29	Identify dedicated funding sources needed to support regional climate change work including implementation of adaptation strategies. Existing funding sources need to be more flexible for adaptation projects.	High	High	Medium	Low	Long-term	Yes	Yes	Yes	Yes	Yes	73%
20	Advance SJAFCA Smith Canal Project (currently under construction).	High	High	High	High	Near-term	No	No	Yes	Yes	No	72%
52	Conduct a Stockton Wye flood adaptation assessment.	High	High	Low	Medium	Medium-term	No	No	No	No	Yes	72%
54	Conduct a BNSF Intermodal Railyard (Stockton) flood adaptation assessment.	High	High	Low	Medium	Medium-term	No	No	No	No	Yes	72%
4	Create a free shade tree program. Regional nonprofits (like Promotores Unidas para Educacion Nacional de Tecnologias Sostenibles (PUENTES)) and stakeholders could provide funding for free shade trees for homeowners/business owners to plant trees alongside roadways and sidewalks. Regional nonprofits to administer the program.	Medium	Low	Low	High	Medium-term	Yes	Yes	Yes	Yes	No	69%

CREATE A REGIONAL CLIMATE COLLABORATIVE

ID: 31, Score: 87%

The top San Joaquin region implementation strategy is to develop a regional climate collaborative, which meets regularly to coordinate and implement responses to climate change. Instituting a collaborative was scored highly in its effectiveness in resiliency capacity building by creating a range of opportunities for cross-sector collaboration and information sharing. The collaborative could also take a leadership role in executing the other implementation strategies for the San Joaquin region. Creating a regional climate collaborative would also be relatively easy to implement, with low costs to start and continue running. The VAWG assembled by SJCOG for its Climate Adaptation and Resiliency Study and this Regional Resiliency Implementation Plan and Adaptation Guidance report could be a potential jumping off point for a regional climate collaborative. SJCOG is already evaluating options and resources available to create a new regional climate collaborative or join one of the existing California climate collaboratives. See the Regional Adaptation Guidance section for more detail on the pathways available for SJCOG to form or join a regional climate collaborative.

DEVELOP A REGIONAL EMERGENCY RESPONSE STRATEGY

ID: 55, Score: 84%

It is a goal of the SJCOG climate change projects to "ensure operation of routes supporting evacuation, staging areas, and emergency response." A regional emergency response strategy could be developed to evaluate existing evacuation and emergency response efforts and specifically identify the role of transportation assets and transit operators during an emergency. The strategy could be created in alignment with the existing San Joaquin Emergency Operations Plan, which outlines the county's all-hazard approach to emergency operations, response and recovery priorities, and roles and responsibilities, and the San Joaquin Local Hazard Mitigation Plan which is anticipated to be completed in January 2023.[4] The strategy can also prioritize the voices of those who cannot evacuate on their own (e.g., older adults, disabled people, those without a personal vehicle, residents of assisted living facilities), who would need support from regional transit operators. A regional emergency response strategy focused on transportation presents an opportunity to identify and address gaps in current emergency preparedness and response efforts and critically integrate the transportation system into response efforts by establishing emergency procedures for transit operators and transportation assets (e.g., setting up contraflow lanes).

CONDUCT A FLOOD ADAPTATION ASSESSMENT FOR SR-4 FROM STOCKTON WEST TO CONTRA COSTA COUNTY

ID: 53, Score: 81%

The SJCOG Climate Adaptation and Resiliency (Phase I) Study identified the most critical and vulnerable assets around the county, including SR-4 from Stockton west to Contra Costa County. This section of SR-4 plays an important role for evacuating the San Joaquin Delta in the event of flooding. However, it operates at a deficient level of service and runs through a 100-year floodplain, and transects tracts projected to be flooded under a one foot of sea level rise (plus storm) scenario. For this reason, a more detailed assessment of this corridor is needed to understand future flood risk and potential adaptation strategies. The assessment should also consider potential impacts to evacuation in the event of a flood event.

[4] San Joaquin County Office of Emergency Services. (n.d.). Local Hazard Mitigation Planning. Accessed on February 24, 2022, from https://www.sjgov.org/department/oes/local-hazard-mitigation-planning

ADVANCE THE LOWER SAN JOAQUIN RIVER FEASIBILITY STUDY

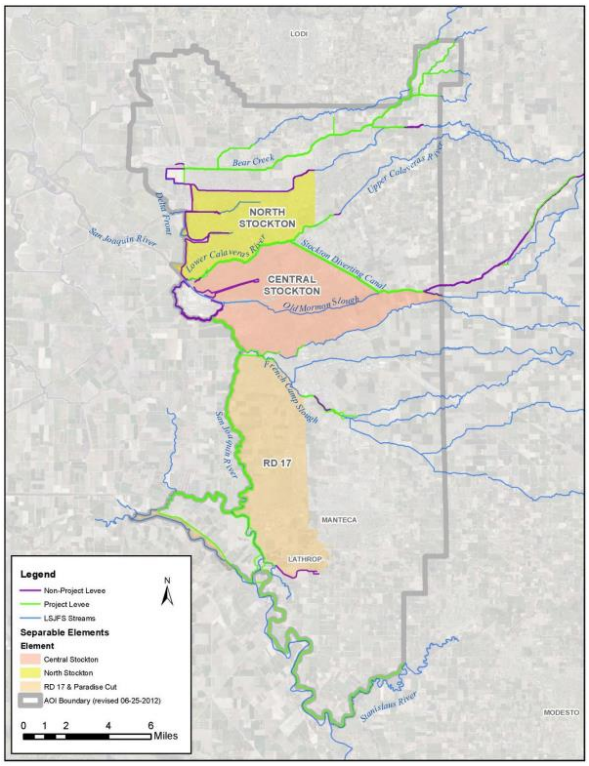

Figure 2: Lower San Joaquin River Feasibility Study project area (Source: USACE)

ID: 22, Score: 80%

The Lower San Joaquin River Feasibility Study will identify flood protection needs for the lower San Joaquin River to protect the City of Stockton, where there is existing flood risk and where there have been major flood events in 1955, 1958, and 1997.[5] The study is a cooperative effort between the US Army Corps of Engineers (USACE), the State Central Valley Flood Protection Board, and the San Joaquin Area Flood Control Agency (SJAFCA). This is a multi-year study which will cover nearly 140 miles of levees and will determine needed improvements for future flood protection in an effort to reach the future 200-year level of flood protection[6], as is required by state and federal regulatory requirements, including SB 5.[7] The completion of the feasibility study will be critical to meeting these requirements and ensuring long term protection of North and Central Stockton, as well as other communities on the lower San Joaquin River. This feasibility study scored highly in the overall Strategy Evaluation Matrix due to its necessity to reduce flood risk in the San Joaquin region.

DEVELOP CLIMATE RESILIENCE METRICS TO EVALUATE 2022 REGIONAL PROJECT PRIORITIZATION

ID: 45 , Score: 79%

As an MPO, SJCOG is responsible for creating the San Joaquin Regional Transportation Plan (RTP)/Sustainable Communities Strategy (SCS), which includes a list of regional projects to advance on the transportation network. Not all projects can move forward given funding constraints and therefore SJCOG must compare and prioritize regional projects. To date, this prioritization process has not considered climate change impacts or how the project may contribute to the overall resilience of the multi-modal transportation network. As part of this strategy, SJCOG could incorporate a new measure for overall project resilience to climate change, so that adaptive and future-oriented projects would be prioritized. SJCOG has developed a few options for what these resilience metrics could be. See the "Regional Adaptation Resources" section for more information and Appendix E for an analysis of resilience metrics options for the 2022 RTP/SCS.

CONDUCT A FLOOD ADAPTATION ASSESSMENT FOR SR-99 THROUGH LODI

ID: 50, Score: 79%

The SJCOG Climate Adaptation and Resiliency (Phase I) Study identified the most critical and vulnerable assets around the county, including SR-99 through Lodi. The study identified this area as a priority vulnerability because it is within the 500-year floodplain and serves as a key transportation corridor for the local community and the region. In addition to serving as a bus corridor between Lodi and Stockton, it serves as an evacuation route, which could easily be overwhelmed during an evacuation given already existing congestion during rush hour. SR-99 also serves as an important connection between Lodi and Sacramento, and significant disruptions

[5] US Army Corps of Engineers. (n.d.). Lower San Joaquin River. Accessed on February 24, 2022, from https://www.spk.usace.army.mil/lower_sj_river/
[6] San Joaquin Area Flood Control Agency. (n.d.) Lower San Joaquin River Feasibility Study. Accessed on February 24, 2022, from https://www.sjafca.org/projects/lower-san-joaquin-river-feasibility-study
[7] San Joaquin Area Flood Control Agency. (2019). *Strategic Plan*. https://www.sjafca.org/home/showpublisheddocument/933/637486408308130000

would occur during flooding or an evacuation. A detailed assessment of flood risk and potential evacuation impacts is needed for SR-99 to understand existing and future risks and identify adaptations.

CONDUCT A FLOOD ADAPTATION ASSESSMENT FOR SOUTH STOCKTON

ID: 51 , Score: 79%

The SJCOG Climate Adaptation and Resiliency (Phase I) Study identified the most critical and vulnerable assets around the county, including the South Stockton Neighborhood. The study identified this area as a priority vulnerability because it has a disproportionally high percentage of transportation-disadvantaged communities compared to the county as a whole and impacts to the transit system will be more acutely felt in South Stockton. Several stops are within the 100-year floodplain and dozens in the 500-year, and while bus rerouting can mitigate these impacts, changes must be effectively communicated to passengers. Furthermore, the Union Pacific (UP) Railroad Stockton Railyard is in the neighborhood and surrounded by the 500-year floodplain. Flooding of tracks and maintenance facilities could have broader system-wide impacts and create access issues for workers and raises concerns about hazardous materials used or stored at UP facilities.

CONDUCT A FLOOD ADAPTATION ASSESSMENT FOR WATERLOO RD/CA-88

ID: 49, Score: 79%

The SJCOG Climate Adaptation and Resiliency (Phase I) Study identified the most critical and vulnerable assets around the county, including Waterloo Road/CA-88. The study identified this area as a vulnerable asset for adaptation action since it serves as an evacuation route. The evacuation route on Waterloo Road/CA-88 originates in the 100-year flood plain and moves east into the 500-year floodplain that serves Stockton residents and Waterloo-area residents, 25% of whom are aged 65 and above in a rural area. Special consideration must be given for this in evacuation planning for the Waterloo area.

CREATE A PUBLIC EDUCATION CAMPAIGN ON CLIMATE CHANGE

ID: 32, Score: 77%

SJCOG framed public survey questions for the Needs Assessment around what community members felt were the most important implementation or adaptation strategies when preparing for extreme weather and climate change. One of the key survey questions was: “What other strategies would you like to see implemented in the San Joaquin region to prepare the community for extreme weather and climate changes?” In response to this question, 20% of people indicated they would like to see educational opportunities for community members to learn about climate change and sustainability (see Figure 3). SJCOG and its stakeholders can develop a public education campaign around climate change impacts in the San Joaquin region and the actions that can be taken to protect the transportation network and the region’s communities. This campaign could also be used to define climate change terminology such as mitigation, adaptation, and resilience. This could also present an opportunity to share resources on emergency preparedness and evacuation, to help the public prepare for and effectively respond to flood events and wildfires.

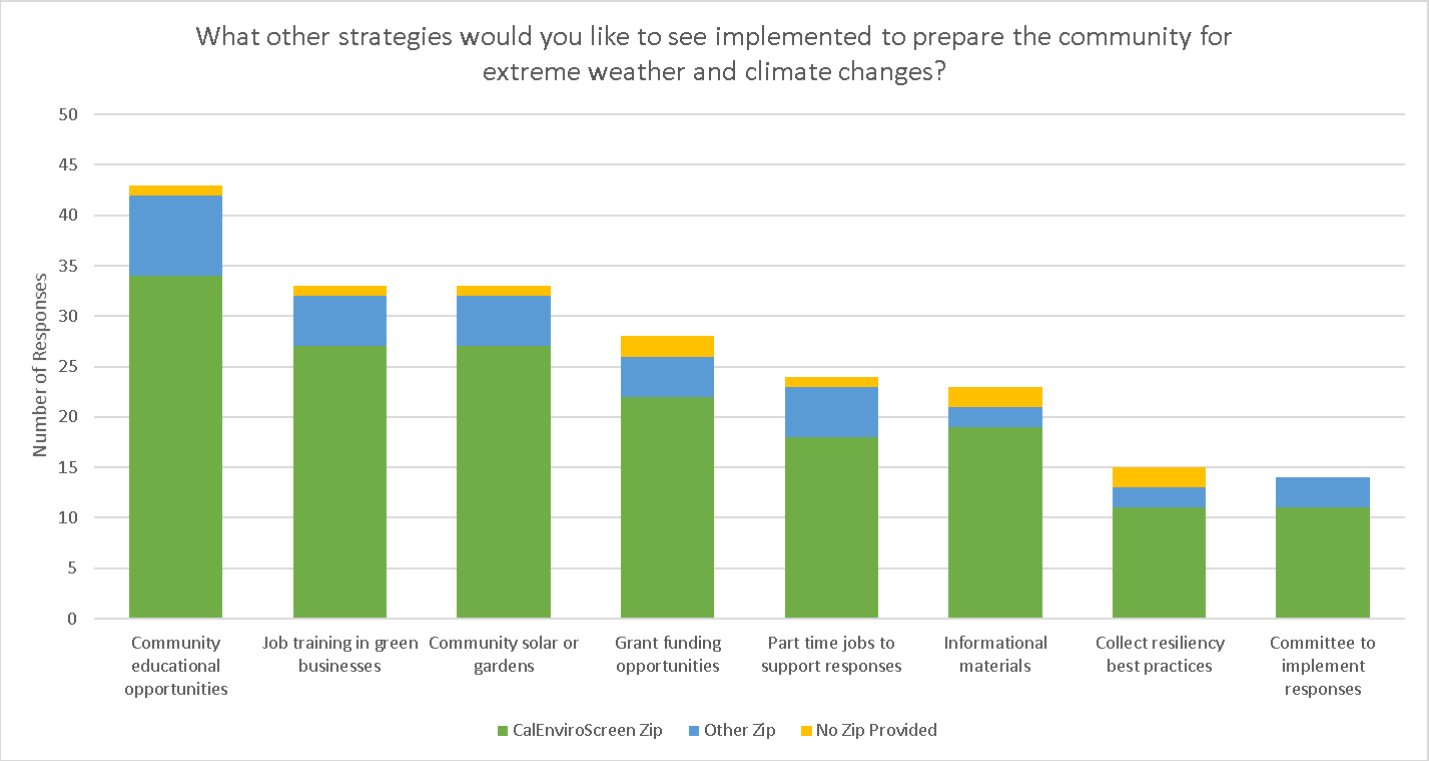

Figure 3: Public Survey Question on Community-Oriented Responses to Climate Change

PROVIDE BETTER COMMUNICATION SERVICES IN EMERGENCIES

ID: 11, Score: 77%

California has faced numerous natural disasters and emergency events in recent years, including devastating wildfires, landslides, floods, and related impacts such as infrastructure damages. These events have often demonstrated a breakdown in communication between emergency responders and with the public. For example, analysis following the record-breaking Camp Fire which burned through Paradise, CA demonstrated multiple failures in getting alerts out to residents. The Butte County Emergency Communications Center used a program called Code Red to issue alerts within the first 150 minutes of the fire, but many of those calls, texts, and emails were not sent as they were supposed to.[8] Miscommunications between emergency responders and local jurisdictions also led to alerts being sent out late.[9] This implementation strategy would involve reviewing the county's existing emergency alert systems, including SJReady, and protocols to identify any gaps and ways in which communication could be improved. For example, the county Office of Emergency Services (OES) may evaluate the ability to provide SJReady emergency alerts to everyone, not just those that opt-in.[10]

DEVELOP BACKUP POWER STRATEGIES FOR TRANSIT

ID: 37, Score: 75%

In the Needs Assessment, stakeholders and community members noted poor reliability of electricity in the hottest months of the year. As is required by the Innovative Clean Transit regulation, San Joaquin Regional Transit District (RTD) is transitioning to zero

[8] Bob Moffit. (2019). Many Residents Did Not Receive Emergency Alerts During The Camp Fire. Will You Be Warned If A Disaster Is Heading Your Way? *Cap Radio*. https://www.capradio.org/articles/2019/07/11/emergency-alert-will-you-be-notified-if-a-wildfire-is-heading-toward-your-town/
[9] Ibid.
[10] Office of Emergency Services. (n.d.). SJ Ready. Accessed on February 24, 2022, from https://sjready.org/

emissions buses (ZEBs).[11] RTD's Board of Directors approved a resolution to convert to 100% electric ZEBs by 2025.[12] Transitioning to all-electric buses could be challenging given more frequent power shutoffs and RTD and other transit providers will need to evaluate back-up power options, such as battery storage and microgrids. Alternatively, transit providers may consider using hydrogen fueled ZEBs instead of or in addition to battery electric buses.

CONTINUE THE MOSSDALE TRACT AREA FLOOD ADAPTATION ASSESSMENT

ID: 21, Score: 75%

The existing levees protecting the SJAFC Mossdale Tract (Reclamation District 17) Area currently do not provide 200-year flood protection and are not in accordance with Senate Bill 5 and the Urban Level of Flood Protection. SJAFC must continue pursuing the achievement of Urban Level of Flood Protection to comply by 2028, which is the deadline required by law AB 838 (previously 2025). The 200-year floodplain depths for the areas protected by levees include I-5, I-205, and SR-120. Implementing flood risk reduction measures provides necessary protection against new development and existing property that is currently located in the floodplain. Additionally, a breach of the Walthall Slough Levee during a 200-yearr flood would result in "Outflanking of the Existing Dryland Levee, impacting RD17 and Manteca". Progress has been made towards the Urban Level of Flood Protection achievement, and as part of the implementation of SJAFCA's adopted Climate Adaptation Policy, SJAFCA identified additional necessary improvements to appropriately increase protection with regards to the uncertainty of climate change impacts.[13]

PROVIDE COMPREHENSIVE BACKUP POWER AT PORT OF STOCKTON

ID: 48, Score: 74%

Representatives from the Port of Stockton were interviewed to inform the Needs Assessment and were asked about the weather/climate hazard impacts which are most concerning to them. They noted that while they had not suffered major impacts from flooding, storm events had caused power outages at the Port. With wildfires becoming a growing threat around the state and power safety shut offs becoming a more common occurrence, the Port has been looking at back-up power options to maintain operations. To date, they have back-up power for critical sections of the Port to continue main operations, but do not have comprehensive back-up power for all areas. This strategy involves identifying additional back-up power options for the Port so that all areas and systems could remain operational during an outage.

UPDATE DESIGN CRITERIA AND GUIDANCE FOR INFRASTRUCTURE PROJECTS TO ADDRESS CLIMATE CHANGE

ID: 17, Score: 74%

Design criteria and guidance is based on historical climate conditions and events. For example, Federal Emergency Management Agency (FEMA) flood maps, which are used to determine base flood elevations for designs, do not reflect climate change and are often outdated.[14] Adjusting design criteria and guidance is a straightforward way to account for future climate projections in design and create more resilient infrastructure. By allowing more flexibility in design through consideration of future scenarios, updated guidance may also allow designers the opportunity to create creative and adaptive designs. Caltrans has already begun considering the effects of climate change on asset design. When interviewed for the Needs Assessment, Caltrans District 10 staff noted that they have been exploring alternative culvert materials for areas with higher wildfire risk. This implementation strategy would involve updating

[11] California Air Resources Board. (2019). *Innovative Clean Transit Regulation Fact Sheet*. https://ww2.arb.ca.gov/resources/fact-sheets/innovative-clean-transit-ict-regulation-fact-sheet
[12] San Joaquin RTD. (n.d.). First in the Nation All-Electric BRT. Accessed on February 24, 2022, from https://sanjoaquinrtd.com/1/first-in-the-nation-all-electric-brt/
[13] San Joaquin Area Flood Control Agency. Mossdale Tract. Accessed on February 24, 2022, from https://www.sjafca.org/projects/mossdale-tract
[14] Thomas Frank. (2020). Studies Sound Alarm on "Badly Out-of-Date" FEMA Flood Maps. *Scientific American*. https://www.scientificamerican.com/article/studies-sound-alarm-on-badly-out-of-date-fema-flood-maps/

the Caltrans Highway Design Manual and local design guidance to ensure that transportation asset design incorporates future climate risks.

ASSESS FLOOD MITIGATION OPTIONS FOR CITY OF STOCKON PUBLIC HOUSING

ID: 40, Score: 74%

The majority of the City of Stockton lies within the 500-year floodplain and is protected by levees, but much of South Stockton lies in a 100-year floodplain.[15] SJAFCA is advancing multiple levee improvement projects in San Joaquin County, including ones that will provide additional flood protection for Stockton (see the "Advance the Lower San Joaquin River Feasibility Study" strategy). However, there may be additional flood mitigation measures that can be taken by the City and its Housing Division to ensure that homes on the Restricted Income Housing List are protected in the event of a flood. Dry floodproofing measures can be used to keep residential structures watertight below the flood level.[16] Wet floodproofing is another option to protect structures from damage and involves "anchoring the structure, using flood resistant materials below the Base Flood Elevation (BFE), protection of mechanical and utility equipment, and use of openings or breakaway walls."[17] Many of the City's housing units may already have these protections in place. Implementing this strategy would involve reviewing the structures on the Restricted Income Housing List and identifying where additional protection may be needed.

IDENTIFY DEDICATED FUNDING SOURCES FOR CLIMATE CHANGE ADAPTATION

ID: 29, Score: 73%

A lack of funding was one of the most frequently cited barriers to climate adaptation noted by stakeholders interviewed for the Regional Needs Assessment. Funding for climate change vulnerability assessments and adaptation projects are often provided through competitive grant programs such as the Caltrans Sustainable Transportation Planning[18] and the FEMA Building Resilient Infrastructure and Communities grant programs.[19] Luckily, California is receiving an influx of funding from Governor Newsom's climate action budget package, which will create new funding sources and bolster existing programs.[20] See the San Joaquin Regional Resilience Web Portal for regional climate resilience resources, including grant funding sources: sjcogresilience2022.com

This implementation strategy could involve collecting a list of all climate resilience competitive funding sources. It could also involve evaluating opportunities for dedicated resilience project funding in San Joaquin County. For example, San Joaquin County voters approved Measure K in 1990 and again in 2006 to fund transportation improvement projects across the county through a half-cent sales tax.[21] While this funding may also be used for transportation projects that make the system more resilient to climate change, it is not dedicated for these kinds of projects. A similar approach could be taken to create a measure for climate change adaptation.

[15] SJCOG. (2020). *Climate Adaptation and Resiliency Study*. https://www.sjcog.org/DocumentCenter/View/5355/SJCOGAdaptationReport_4220?bidId=
[16] Federal Emergency Management Agency. (n.d.). Dry Floodproofing. Accessed on February 25, 2022, from https://emilms.fema.gov/IS321/HM0103040text.html
[17] Federal Emergency Management Agency. (2021). Wet Floodproofing. Accessed on February 25, 2022, from https://www.fema.gov/glossary/wet-floodproofing
[18] Caltrans. (n.d.). Sustainable Transportation Planning Grants. Accessed on February 25, 2022 from https://dot.ca.gov/programs/transportation-planning/regional-planning/sustainable-transportation-planning-grants
[19] Federal Emergency Management Agency. (2022). Building Resilient Infrastructure and Communities. https://www.fema.gov/grants/mitigation/building-resilient-infrastructure-communities
[20] Office of Governor Gavin Newsom. (2021). Governor Newsom Signs Climate Action Bills, Outlines Historic $15 Billion Package to Tackle the Climate Crisis and Protect Vulnerable Communities. https://www.gov.ca.gov/2021/09/23/governor-newsom-signs-climate-action-bills-outlines-historic-15-billion-package-to-tackle-the-climate-crisis-and-protect-vulnerable-communities/
[21] SJCOG. (n.d.). Measure K. Accessed on February 25, 2022, from https://www.sjcog.org/300/Measure-K

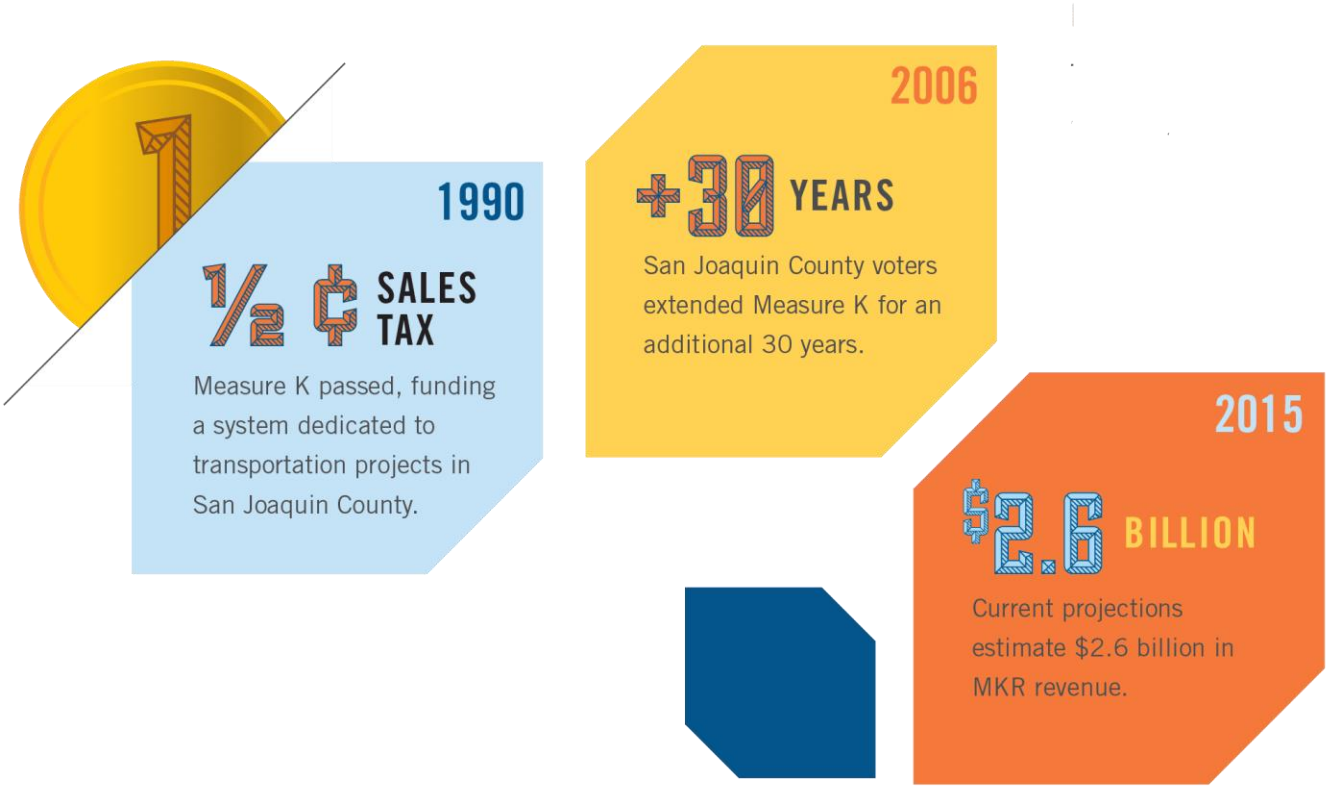

Figure 4: Timeline for Measure K Funding

Another option is to create a sustainable funding source for climate resiliency through the establishment of a regional Vehicle Miles Traveled (VMT) mitigation fee, bank, or exchange. Senate Bill 743 eliminates measures of vehicle capacity as a basis used to determine significant impacts of a project under the California Environmental Quality Act (CEQA). Instead, transportation impacts are now measured based upon changes to VMTs.[22] For example, if a new housing development is proposed in an area where single occupancy vehicle use is the predominant mode of transportation, there may be findings of significant impact due to anticipated increases in VMTs the housing project would generate. In these cases, the lead agency would need to take mitigative action through VMT reduction strategies. These strategies are often a physical infrastructure improvement in the project area. Where on-site mitigations are not feasible, program-based approaches can be used to collect funds for larger and more effective VMT reduction projects.[23] These program-based approaches include the following:

- **VMT-based Transportation Impact Fee program** – This is a traditional transportation impact fee program with a focus on VMT reduction. A VMT reduction goal would be set consistent with the CEQA threshold established by the lead agency for SB 743. This would result in a capital improvement program (CIP) for alternative transportation projects.[24]
- **VMT Mitigation Exchange** – Alternatively, the lead agency can set up an exchange, which relies on a developer agreeing to implement a VMT reducing project near the proposed project, in the same community, or even outside but nearby the community. To conduct an exchange, there needs to be a facilitator who matches the VMT generating project with a VMT reducing project or action.[25]

[22] Fehr and Peers. (2020). VMT Mitigation Through Fees, Banks, and Exchanges Understanding New Mitigation Approaches. https://www.fehrandpeers.com/wp-content/uploads/2020/04/VMT-Fees_Exchanges_Banks-White-Paper_Apr2020.pdf
[23] Ibid.
[24] Ibid.
[25] Ibid.

- **VMT Mitigation Bank** – A mitigation bank creates a monetary value for VMT reduction and allows a developer to purchase VMT reduction credits. Funds generated from the purchase of credits are used for VMT reduction projects. Evidence and monitoring would be required to ensure that funds are going towards projects that achieve the desired level of VMT reductions.[26]

These program-based VMT mitigation strategies could be used to sustainably generate funds from planned transportation, or other development projects, for alternative transportation projects that reduce VMTs in the San Joaquin region. The funds may also be leveraged for transportation projects that improve the overall resilience of the transportation network and build new transportation infrastructure that is designed based on future climate projections.

ADVANCE SMITH CANAL PROJECT

ID: 20, Score: 72%

The Smith Canal Gate Project is currently under construction until November 2022. This project includes a floodwall along the San Joaquin River and ties into the existing FEMA accredited levee. Once construction is complete, the Smith Canal Project will be compliant with State and Federal standards for flood protection. The Reclamation District 1614 is also upgrading the Wisconsin storm water pump station. FEMA intends to begin the map revision process for removing the "high risk" flood zone designation once both projects are complete, confirming that the project will provide the required 100-year flood protection and effectively eliminating the mandatory National Flood Insurance Program requirements. This impacts approximately 5,000 properties and prevents an additional 3,000 properties from being included in the high-risk zone.[27]

CONDUCT A STOCKTON WYE FLOOD ADAPTATION ASSESSMENT

ID: 52, Score: 72%

The SJCOG Climate Adaptation and Resiliency (Phase I) Study identified the most critical and vulnerable assets around the county, including the Stockton Wye. The study identified this area as a priority vulnerability since it serves as an important freight rail junction between UP and BNSF, and new projects are underway to grade-separate the tracks. The Wye is currently mapped within the 500-year floodplain and are protected by levees that may offer some flood protection but are not accredited for 500-year protection. Disruption to this intersection would have significant impacts to goods movements, including to and from the Port of Stockton, so further study is needed to determine adaptation measures that could reduce the severity of these impacts.

CONDUCT A BNSF INTERMODAL RAILYARD FLOOD ADAPTATION ASSESSMENT

ID: 54, Score: 72%

The SJCOG Climate Adaptation and Resiliency (Phase I) Study identified the most critical and vulnerable assets around the county, including the BNSF Intermodal Railyard. The study identified this area as a priority vulnerability since it lifts approximately 300,000 container units annually and serves as a freight hub between Northern California and the Midwest and is located within the 100-year floodplain. Interruptions at this facility would have major economic consequences and disrupt critical supply chains.

[26] Ibid.
[27] San Joaquin Area Flood Control District. (n.d.). Smith Canal Gate Structure. https://www.sjafca.org/projects/smith-canal-gate-structure

Figure 5: Tree Planting for the PUENTES Urban Tree Canopy Revival Project (Source: California Climate Investments)

CREATE A FREE SHADE TREE PROGRAM

ID: 4, Score: 69%

Many of the stakeholders interviewed and members of the public surveyed for the Needs Assessment noted that higher temperatures and heat waves are a major concern and already affect day-to-day travel. And, when asked about priority transportation improvements they would like to see implemented, 17% of public survey respondents thought more trees should be planted along roads and sidewalks. One of the simplest ways to mitigate high temperatures and UHI is through planting shade trees. Promotores Unidas para Educacion Nacional de Tecnologias Sostenibles (PUENTES) is a Stockton-based nonprofit which led the San Joaquin County Urban Tree Canopy Revival project. This project planted over 1,200 new trees in Stockton's disadvantaged communities to restore the city's urban tree canopy.[28] This project was funded by a Cal Fire Urban and Community Forestry Program grant. One way to allow for continued shade tree plantings in Stockton and other San Joaquin County communities is through a free shade tree program with dedicated funding. There is an existing case study of such a program in Sacramento where the local utility, the Sacramento Municipal Utility District (SMUD), has worked in partnership with the Sacramento Tree Foundation to plant more than 600,000 trees in the area since 1990.[29] San Joaquin region nonprofits like PUENTES could administer the program and their partners could provide funding for free shade trees for homeowners and business owners to plant alongside roadways and sidewalks.

[28] California Climate Investments. (n.d.). 2018 Project Profiles. Accessed on February 25, 2022, from https://www.caclimateinvestments.ca.gov/2018-profiles/2018/1/10/urban-tree-canopy-revival-project-san-joaquin-county

[29] SMUD. (n.d.). Free Shade Tree Program. Accessed on February 25, 2022, from https://www.smud.org/en/Going-Green/Free-Shade-Trees

EASY TO IMPLEMENT AND NEAR-TERM STRATEGIES

The following section summarizes the top 20 easy to implement and near-term implementation strategies. SJCOG decided to create this separate ranking to identify the best strategies that can be accomplished in the near-term. The subsections following Table 4 briefly summarize the top 20 easy to implement and near-term strategies. **Several of these strategies overlap with the top 20 overall strategies listed above and those descriptions are not repeated.**

Table 4: Top Easy to Implement, Near-Term Regional Implementation Strategies

ID	Strategy	Effectiveness	Capital Cost	O&M Cost	Ease of local implementation	Timeframe for implementation	Alignment with existing projects and funding	Co-Benefits: GHG reductions	Co-Benefits: Local environmental benefits	Co-Benefits: Community health and safety benefits	Co-Benefits: Disadvantaged community benefits	Co-Benefits: Improvements to transportation system	High Ease of Implementation Strategy Score[30]
31	Regional Climate Collaborative or committee to coordinate and implement responses to climate change. Cross-sector collaboration including public health, community-based organizations (CBOs), Climate Action Corps, and private sector. (SB 5 coordination could be good case study for this coordination.)	High	Low	Low	High	Near-term	No	Yes	Yes	Yes	Yes	No	87%
22	Continue critical projects in progress by the San Joaquin Area Flood Control Agency (SJAFCA). The Lower San Joaquin River Feasibility Study.	High	High	High	High	Near-term	Yes	No	No	Yes	Yes	No	80%
45	Develop climate resilience metrics to evaluate 2022 RTP/SCS project list and overall prioritization.	High	Low	Low	High	Near-term	Yes	No	No	Yes	No	Yes	79%

[30] Scores are out of 100%.

ID	Strategy	Effectiveness	Capital Cost	O&M Cost	Ease of local implementation	Timeframe for implementation	Alignment with existing projects and funding	Co-Benefits: GHG reductions	Co-Benefits: Local environmental benefits	Co-Benefits: Community health and safety benefits	Co-Benefits: Disadvantaged community benefits	Co-Benefits: Improvements to transportation system	High Ease of Implementation Strategy Score[30]
32	Public education campaign to ensure that the broader public understands climate change projections, impacts, and adaptation strategies, and the terminology surrounding these topics. There have been good efforts through the Office of Emergency Services to list information on their website about potential risks. This could be taken a step further with public campaigns or explicit partnerships with organizations. The public education campaign should include information about evacuation prep, the act of evacuating, and returning home.	High	Low	Low	High	Medium-term	No	No	No	Yes	Yes	No	**77%**
37	Backup power strategies to ensure that electric transit can still provide regular service or assist in evacuation when there are outages.	High	Medium	Medium	High	Long-term	Yes	No	No	Yes	Yes	Yes	**75%**
48	More comprehensive backup power at Port of Stockton during outages.	High	Medium	High	High	Near-term	No	No	No	No	No	Yes	**74%**
17	Update design criteria and guidance for infrastructure projects to address climate change. Including Caltrans Highway Design Manual.	High	Low	Low	High	Near-term	No	No	No	No	No	Yes	**74%**

ID	Strategy	Effectiveness	Capital Cost	O&M Cost	Ease of local implementation	Timeframe for implementation	Alignment with existing projects and funding	Co-Benefits: GHG reductions	Co-Benefits: Local environmental benefits	Co-Benefits: Community health and safety benefits	Co-Benefits: Disadvantaged community benefits	Co-Benefits: Improvements to transportation system	High Ease of Implementation Strategy Score[30]
20	Continue critical projects in progress by the San Joaquin Area Flood Control Agency (SJAFCA). Advance Smith Canal Project (currently under construction).	High	High	High	High	Near-term	Yes	No	No	Yes	Yes	No	72%
4	Regional nonprofits (like Promotores Unidas para Educacion Nacional de Tecnologias Sostenibles (PUENTES)) and stakeholders provide funding for free shade trees for homeowners/business owners to plant trees alongside roadways and sidewalks. Regional nonprofits to administer the program.	Medium	Low	Low	High	Medium-term	Yes	Yes	Yes	Yes	Yes	No	69%
7	Expand bus routes and hours with increased frequency and reliability, particularly in Disadvantaged Communities such as South Stockton.	Medium	Medium	Medium	High	Near-term	No	Yes	Yes	Yes	Yes	Yes	68%
1	Template language about climate change impacts and responses for General Plans (for compliance with SB 379).	Medium	Low	Low	High	Near-term	Yes	No	No	Yes	Yes	Yes	60%
10	Free transit to cooling centers on hot days.	Medium	Low	Low	High	Near-term	No	No	No	Yes	Yes	No	55%

ID	Strategy	Effectiveness	Capital Cost	O&M Cost	Ease of local implementation	Timeframe for implementation	Alignment with existing projects and funding	Co-Benefits: GHG reductions	Co-Benefits: Local environmental benefits	Co-Benefits: Community health and safety benefits	Co-Benefits: Disadvantaged community benefits	Co-Benefits: Improvements to transportation system	High Ease of Implementation Strategy Score[30]
56	Create a project manager guidance/checklist for SCS/RTP project managers to consider climate risks in the planning and design phases of projects identified as vulnerable to one or more climate hazards.	Medium	Low	Low	High	Near-term	Yes	No	No	No	No	Yes	**51%**
23	Identify the best practices or projects that other cities/counties are conducting in terms of responses to wildfires, evacuations, flood events.	Medium	Low	Low	High	Near-term	Yes	No	No	No	No	No	**47%**
25	Create one platform or clearinghouse for climate change information and best practices for adaptation. Potential to coordinate with DSC on this.	Medium	Low	Low	High	Near-term	Yes	No	No	No	No	No	**47%**
2	Develop climate resilience policy language for the 2022 RTP/SCS which can also be used as template language around climate change by local jurisdictions and partner agencies.	Medium	Low	Low	High	Near-term	No	No	No	No	No	No	**45%**
12	Expanded on-demand transit (paratransit).	Low	Medium	Medium	High	Medium-term	Yes	Yes	Yes	Yes	Yes	Yes	**35%**
38	Provide water for active transportation users.	Low	Medium	Low	High	Near-term	No	No	No	Yes	Yes	No	**27%**

CREATE A REGIONAL CLIMATE COLLABORATIVE

Description provided under Top Implementation Strategies.

ADVANCE THE LOWER SAN JOAQUIN RIVER FEASIBILITY STUDY

Description provided under Top Implementation Strategies.

DEVELOP CLIMATE RESILIENCE METRICS TO EVALUATE 2022 REGIONAL PROJECT PRIORITIZATION

Description provided under Top Implementation Strategies.

CREATE A PUBLIC EDUCATION CAMPAIGN ON CLIMATE CHANGE

Description provided under Top Implementation Strategies.

DEVELOP BACKUP POWER STRATEGIES FOR TRANSIT

Description provided under Top Implementation Strategies.

PROVIDE COMPREHENSIVE BACKUP POWER AT PORT OF STOCKTON

Description provided under Top Implementation Strategies.

UPDATE DESIGN CRITERIA AND GUIDANCE FOR INFRASTRUCTURE PROJECTS TO ADDRESS CLIMATE CHANGE

Description provided under Top Implementation Strategies.

ADVANCE SMITH CANAL PROJECT

Description provided under Top Implementation Strategies.

CREATE A FREE SHADE TREE PROGRAM

Description provided under Top Implementation Strategies.

EXPAND BUS ROUTES AND HOURS WITH INCREASED FREQUENCY, PARTICULARLY IN UNDERSERVED COMMUNITIES

ID: 7, Rank: 10

While the State of California has identified public transit as a critical climate change mitigation strategy, many communities lack access. Additionally, riders can sometimes be left vulnerable to an ever-changing climate. While the San Joaquin region has advanced many needed transportation projects through Measure K and other initiatives, transit improvements are still needed, especially for bus infrastructure (e.g., bus stops) and schedules (e.g., shorter headways). When surveyed for the Regional Needs Assessment, 13% of public survey respondents thought more comfortable, shaded transit stops were needed and 14% of public survey respondents were interested in expanded bus routes and hours. Multiple survey respondents commented that they were interested in expanded bus service, including more dense coverage of bus routes and more frequent headways. This implementation strategy would involve working with regional transit providers, especially providers of bus service such as the San Joaquin Regional Transit District (RTD), to identify funding/budget opportunities to update bus stops and provide expanded service. This work may also include identifying

specific bus stops which should be prioritized due to a lack of shade and projected higher temperatures and more frequent extreme heat events.

DEVELOP TEMPLATE LANGUAGE FOR GENERAL PLAN SAFETY ELEMENTS FOR COMPLIANCE WITH SB 379

ID: 1, Rank: 11

Under current State law, every city and county must adopt a general plan. Senate Bill (SB) 379 (Jackson), passed in 2015, requires cities and counties to include climate adaptation and resilience strategies in the safety elements of their general plans on or before January 1, 2022, and update the element no less than every eight years after inclusion. California's Office of Planning and Research (OPR) conducted a survey in 2020 to understand how local governments were meeting SB 379 requirements. Of the 57 survey respondents, only 23% had completed the requirements. To assist local jurisdictions, several regional organizations such as the Southern California Association of Governments (SCAG) and Fresno COG have developed SB 379 compliance guidance. SJCOG proposed this strategy and has developed template language to support its member jurisdictions in meeting SB 379 requirements. See the Regional Adaptation Guidance section for more information and Appendix D for SJCOG's general plan safety element template language on climate change vulnerabilities and adaptation strategies.

PROVIDE FREE TRANSIT TO COOLING CENTERS ON HOT DAYS

ID: 10 , Rank: 12

When asked about what transportation improvements they would like to see made in the San Joaquin region, 8% of public survey respondents answered that free transit to cooling centers should be provided on hot days. For example, the Fresno Area Express (FAX) has implemented such a program in the Fresno area and will provide free transit to cooling centers that are on existing routes on days above 105 degrees Fahrenheit.[31] This implementation strategy would likely be led by the region's transit operators, including RTD, Manteca Transit, and others, and would first involve identifying existing cooling center locations which are situated on existing routes.[32,33] Next, transit providers would need to work with cooling centers and/or local jurisdictions to identify the temperature threshold at which cooling centers are open and free transit would be provided. At this point, San Joaquin transit operators could estimate potential operational and rider impacts by looking at projections of extreme heat days (the Cal-Adapt tool can be used to estimate the number of extreme heat days above the determined threshold).[34] Operators could identify potential funding sources to cover transit fare on these hot days or incorporate into their operating expenses. FAX could be a useful example and stakeholder to engage when advancing this strategy.

CREATE PROJECT MANAGER GUIDANCE TO CONSIDER CLIMATE RISKS IN PLANNING AND DESIGN

ID: 56, Rank: 13

Many regional organizations have already begun to incorporate resilience strategies into their long-range plans and projects, and several have deployed funding and resources to help communities implement resilience strategies identified in the SCS. SJCOG developed an SCS checklist for project managers to consider climate risks in the planning and design phases of projects that have been

[31] City of Fresno. (2021). Ride FAX Buses to Fresno Cooling Centers. Accessed on February 25, 2022, from https://www.fresno.gov/transportation/ride-fax-buses-to-fresno-cooling-centers/
[32] SJCOG. (n.d.). Transit Planning. Accessed on February 25, 2022, from https://www.sjcog.org/119/Transit-Planning
[33] Anisca Miles. (2021). List: San Joaquin County Area Cooling Centers. Accessed on February 25, 2022, from https://fox40.com/news/local-news/list-san-joaquin-county-area-cooling-centers/
[34] Thomas, N., Mukhtyar, S., Galey, B., Kelly, M. (University of California Berkeley). 2018. Cal-Adapt: Linking Climate Science with Energy Sector Resilience and Practitioner Need. California's Fourth Climate Change Assessment, California Energy Commission. Publication Number: CCCA4-CEC-2018-015. https://cal-adapt.org/tools/extreme-heat/

identified as vulnerable to one or more climate hazards. See the "Regional Adaptation Resources" section for more information and Appendix F for the complete climate change checklist.

IDENTIFY BEST PRACTICES OR PROJECTS THAT OTHER CITIES AND COUNTIES ARE IMPLEMENTING TO RESPOND TO CLIMATE HAZARDS AND EMERGENCIES

ID: 23, Rank: 14

This represents another implementation strategy suggested by the stakeholders interviewed for the Regional Needs Assessment. Stakeholders noted that an analysis is needed to understand best practices from other cities and counties responding to wildfires, flood events, and evacuations. These case studies could be used to inform San Joaquin practices and projects. The SJCOG Regional Resilience Web Portal includes several such case studies from the Central Valley.[35] This list could be expanded upon as part of this implementation strategy and the compiled best practices and case studies could be housed on the SJCOG web portal. See the next section below for more on the SJCOG Regional Resilience Web Portal.

CREATE ONE PLATFORM FOR REGIONAL CLIMATE CHANGE INFORMATION

ID: 25, Rank: 14

SJCOG has created a Regional Resilience Web Portal of resources for SJCOG member jurisdictions and other county stakeholders working on climate change, which will be housed here: sjcogresilience2022.com

The purpose of the web portal is to provide a convenient and easily accessible location for SJCOG member jurisdictions and other stakeholders to access resources for climate change research, data, case studies, and grant funding, that jurisdictions and the broader San Joaquin region can use to inform and fund climate change assessments and adaptation planning. The Regional Resilience Web Portal also summarizes the content of the Regional Resiliency Implementation Plan and Adaptation Guidance, along with the regional adaptation reference documents SJCOG has created so far (see the Regional Adaptation Resources section). The resources housed on the portal also contain relevant Federal and State guidance documents, including guidance documents from FHWA, California Natural Resources Agency, California Governor's Office of Emergency Services, and California Governor's Office of Planning and Research. Creating a singular platform for regional climate change information with a focus on the San Joaquin area enables SJCOG member jurisdictions to efficiently locate information relevant as their planning efforts expand. Additionally, a singular platform will be easier for SJCOG to update with new information as it becomes available.

DEVELOP CLIMATE RESILIENCE POLICY TEMPLATE LANGUAGE

ID: 2, Rank: 16

SJAFCA developed a Climate Change Adaptation Policy that accounts for the upward trend of hydrology and calls for additional factors of safety for flood infrastructure design, as well as purchasing the additional right of way needed to increase the resiliency of levee structures.[36] The policy creates a process for adopting design standards for proposed projects and can serve as an example for other climate change policies in the San Joaquin Region. This implementation strategy would involve reviewing existing policies, such as SJAFCA's, and developing template language that could be adopted by SJCOG member jurisdictions and other regional stakeholders, especially infrastructure managers.

EXPAND ON-DEMAND TRANSIT

ID: 12, Rank: 17

[35] sjcogresilience2022.com
[36] SJAFCA Interview. March 23rd, 2021.

When asked what transportation improvements are needed in San Joaquin County, 7% of Regional Needs Assessment survey respondent answered that they would like to see expanded on-demand transit. Paratransit and on-demand transit services are already provided by RTD's "Dial-a-Ride" and through ACCESS San Joaquin, which is a Consolidated Transportation Services Agency whose primary goal is to "improve the quality of transportation services for low-mobility groups such as seniors and people with disabilities."[37,38] SJCOG maintains a map of existing paratransit jurisdictions across the county and paratransit is currently available in Lodi, Stockton, Tracy, Manteca, Ripon, and Escalon.[39] San Joaquin County transit operators also provide deviated fixed route service, which is a hybrid of fixed-route and on-demand transit service. In this case, a bus or van will stop at fixed points but can deviate from its route between two stops to go to a different stop as scheduled by the user. Deviated fixed routes are operated by RTD, Ripon Blossom Express, and eTrans.[40] To advance this implementation strategy, SJCOG, ACCESS San Joaquin, regional transit operators, and local jurisdictions could review current on-demand transit, paratransit, and deviated fixed route service boundaries and identify opportunities to expand those boundaries to more rural communities and evaluating potential funding opportunities.

PROVIDE FREE WATER FOR ACTIVE TRANSPORTATION USERS

ID: 38, Rank: 18

The summer of 2020 was very difficult for those who used bikes for transportation and are in high-risk professions (such as farm workers). Regional bike nonprofits such as Bike Lodi and the San Joaquin Bike Coalition coordinated with these workers to provide free water along their commute. Bike Lodi noted that many of these workers would walk or bike to a designated location and then get picked up and taken to work. There were serious health concerns for these types of workers due to the ongoing COVID-19 pandemic, wildfires, extreme heat, and poor air quality.[41] Bike nonprofits, other community-based organizations, and local jurisdictions could supply and distribute free water to active transportation users on extreme heat days.

[37] San Joaquin Regional Transit District. (n.d.). BRT Express. https://sanjoaquinrtd.com/services/
[38] San Joaquin Regional Transit District. (n.d.). Access San Joaquin. https://sanjoaquinrtd.com/access-sj/
[39] SJCOG. (n.d.). Transit Planning. https://www.sjcog.org/119/Transit-Planning
[40] Ibid.
[41] Bike Lodi and San Joaquin Bike Coalition Interview. February 26th, 2021

REGIONAL ADAPTATION GUIDANCE

GENERAL PRINCIPLES AND APPROACHES

Infrastructure planners, managers, designers, and operators already know how to address inclement weather and hazards such as flooding and high temperatures. There is a traditional suite of strategies used to mitigate, avoid, or respond to these impacts. Climate change adaptation often involves applying these same strategies, but with an eye for future projections and their risks and uncertainties. This section describes some of the principles and strategies that can be used to inform adaptation decision-making as depicted in Figure 6.

Figure 6: Factors to Inform Adaptation Decision-Making (Source: Fresno COG Transportation Network Vulnerability Assessment)

FEDERAL AND STATE ADAPTATION RESOURCES

There are numerous resources and guidance documents on adaptation strategy approaches and evaluations available for use across the State of California. A collection of climate resilience resources has been compiled as part of the Phase II Study and is housed on a SJCOG Regional Resilience Web Portal created for the project (see sjcogresilience2022.com). Several of these resources include federal and state guidance documents for how to assess climate change and incorporate findings into decision-making. A selection of some of the most useful and important guidance documents for SJCOG member jurisdictions and stakeholders are briefly summarized below:

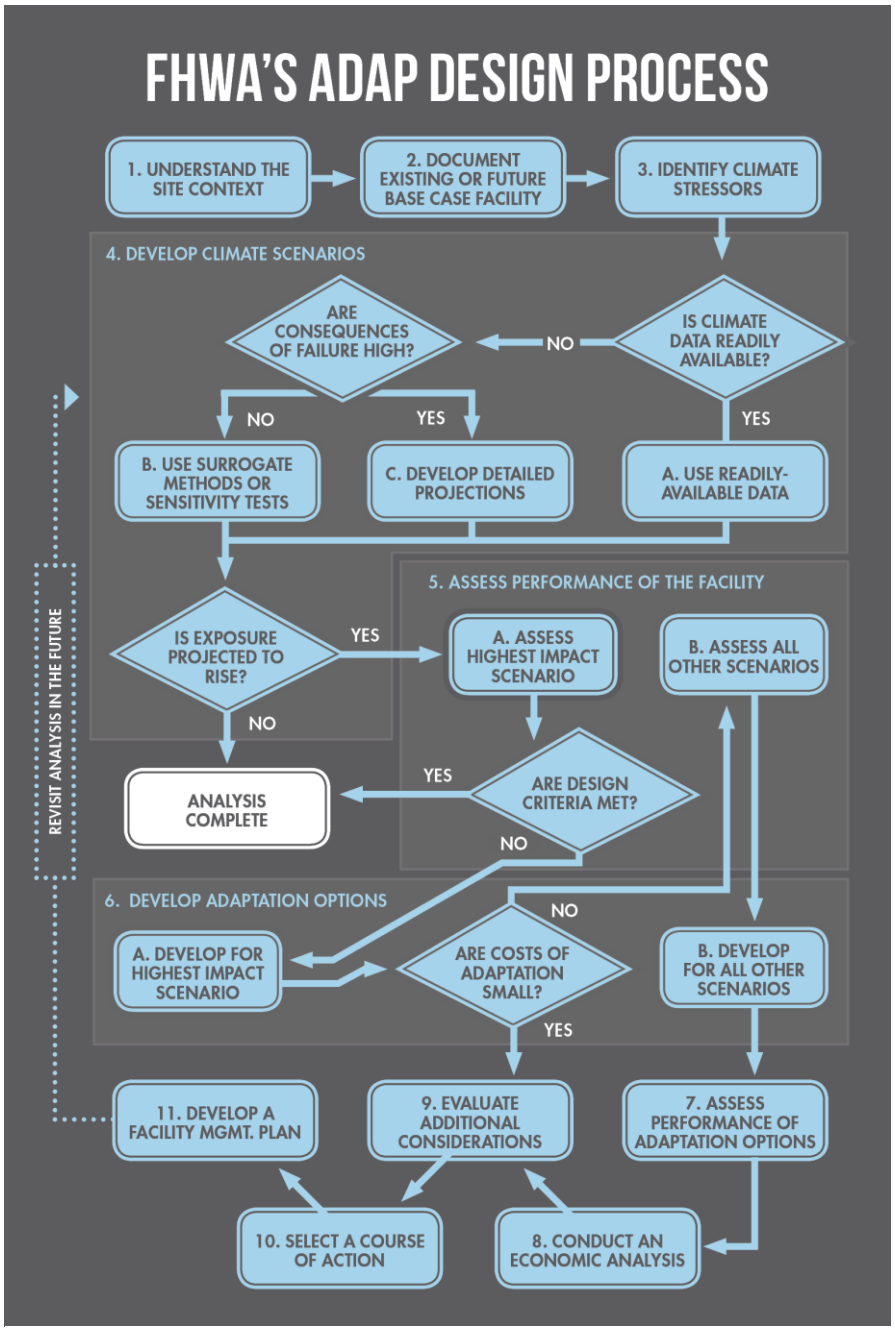

Figure 7: FHWA'S Adaptation Decision-Making Assessment Process

ADAPTATION PLANNING GUIDE (2020)

The 2020 California Adaptation Planning Guide is the most recent update of the Adaptation Planning Guide, first released in 2012. This guide is designed to support the integration of best practices to the adaptation planning efforts of local government, regional organizations, and climate collaborative groups. This guide includes a recommended approach that integrates climate adaptation and resilience across sectors, provides helpful resources to local governments as they comply with state requirements, and advice on community-level climate change adaptation planning.

FHWA ADAPTATION DECISION-MAKING ASSESSMENT PROCESS (2019)

FHWA has developed the Adaptation Decision-Making Assessment Process (ADAP) as a tool to account for the role of climate change in the design of civil works projects. This tool provides a scenario-based framework to generate information needed such as life cycle cost, resilience, and regulatory settings intended to aid decision makers in determining project alternatives based on costs and benefits (see Figure 7).[42] The ADAP process is a risk-based approach that addresses these challenges through several features:

- It uses climate scenario analysis to understand how an asset would perform under different future conditions.
- It assesses benefits and costs of different adaptations across the lifecycle of the asset.

[42] Federal Highway Administration. (n.d.). Adaptation Decision-Making Assessment Process. https://www.fhwa.dot.gov/environment/sustainability/resilience/ongoing_and_current_research/teacr/adap/index.cfm

- It includes a consideration of socioeconomic benefits and costs in addition to asset-focused costs from damage, repair, and lost revenue.

PLANNING AND INVESTING FOR A RESILIENT CALIFORNIA (2017)

The California Governor's Office of Planning and Research (OPR) guidebook entitled *Planning and Investing for a Resilient California* aims to "inform planning and investment processes to address the two primary elements of resilience – planning for future conditions and doing planning itself differently."[43] This guidebook was developed by OPR and a Technical Advisory Group of California state agencies to address the requirements of Executive Order B-30-15, which requires consideration of climate change in state-funded investments.

CLIMATE RESILIENCE POLICY AND FUNDING OPPORTUNITIES

The below sections identify climate resilience policies and funding opportunities as enacted by the federal and California state governments.

FEDERAL POLICY AND FUNDING

Policy

Another key consideration of adaptation decision-making is federal and state policy related to climate resilience. While there are still limited policies related to climate resilience at the federal level, the Biden administration is demonstrating renewed federal commitment towards building resilient infrastructure and addressing the climate crisis through the passing of the Bipartisan Infrastructure Deal (Infrastructure Investment and Jobs Act), which will "reauthorize surface transportation programs for five years and invest $110 billion in additional funding to repair our roads and bridges and support major, transformational projects."[44]

President Biden also reversed a previous Obama-era flood protection law, the Federal Flood Risk Management Standard (FFRMS), by issuing Executive Order (EO) 14030, Climate-Related Financial Risk.[45] The FFRMS, in part, requires the use of higher flood elevations when determining freeboard, which is the additional height a structure is placed above the Base Flood Elevation.[46],[47]

Funding

One of the most important aspects of implementing adaptation is securing the funding to do so. The Bipartisan Infrastructure Law will provide an influx of funding for resilient infrastructure investments, including for transportation. Key climate resilience funding stimulus includes but is not limited to the following:

- **FEMA Building Resilient Infrastructure and Communities (BRIC):** $1 billion will go to the program, which provides grants for infrastructure project planning, design, and technical assistance to build community resilience and reduce impacts of disasters.[48]

[43] Governor's Office of Planning and Research. (2017). Accessed on February 25, 2022, from https://opr.ca.gov/planning/icarp/resilient-ca.html
[44] The White House. (n.d.). President Biden's Bipartisan Infrastructure Law. Accessed on February 25, 2022, from https://www.whitehouse.gov/bipartisan-infrastructure-law/
[45] Federal Emergency Management Agency. (2021). Partial Implementation of the Federal Flood Risk Management Standard for Hazard Mitigation Assistance Programs (Interim). Accessed on February 25, 2022, from https://www.fema.gov/sites/default/files/documents/fema_policy-fp-206-21-0003-partial-mplementation-ffrms-hma-programs-interim.pdf
[46] Ibid.
[47] Federal Emergency Management Agency. (2020). Freeboard. Accessed on February 25, 2022, from https://www.fema.gov/glossary/freeboard
[48] https://www.naco.org/resources/legislative-analysis-counties-infrastructure-investment-jobs-act

- **Nationally Significant Freight and Highway Projects Discretionary Grant Program (currently known as "INFRA"):** $8 billion for the program, which is authorized in current law and funds critical infrastructure and freight projects of regional and national significance. The law clarifies the eligibility of resiliency projects for this program.
- **The Promote Resilient Operations for Transformative, Efficient, and Cost-saving Transportation (PROTECT Act) formula and grant programs** provide:
    - $7.3 billion in formula funds and $1.4 billion in competitive grants.
    - Grants comprise resilience improvements, community resilience, evacuation routes, and at-risk coastal infrastructure.
    - Non-Federal share can be reduced if the State meets voluntary planning requirements.
        - By 7 percent if the State develops a resiliency improvement plan.
        - By 3 percent if the State incorporates resilience in its LRTP.
- **Strengthening Mobility and Revolutionizing Transportation (SMART) Grant Program:** $500 million for a new competitive grant program for demonstration projects that implement advanced smart city or community technologies and systems to improve transportation efficiency and safety. Part of the criteria for eligibility include "improve energy efficiency, reduce pollution and increase the resiliency of the transportation system; and improve emergency response" among others.
- **Local and Regional Project Assistance (previously known as TIGER, BUILD, RAISE programs):** $7.5 billion for a new competitive grant program to fund projects that will have a significant local or regional economic impact and improve transportation infrastructure. Eligible applicants are states, local governments, transit agencies, and Tribes. Eligible projects include projects to replace culverts or prevent stormwater runoff.

STATE POLICY AND FUNDING

Policy

- Contrary to the federal level, there are numerous state EOs, Assembly Bills (AB), and Senate Bill (SB) which govern climate resilience actions. Many of these target work led by state agencies. For example, California EO B-30-15, signed in 2015, requires that state agencies "take climate change into account in their planning and investment decisions. Assembly Bill 2800, approved in 2016, codifies EO B-30-15 and requires state agencies to account for "current and future impacts of climate change when planning, designing, building, operating, maintaining and investing in state infrastructure." Other policies are directed at the regional or local level. See Table 5 for a list of California climate change legislation, related to both GHG gas mitigation and climate resilience. The following summarizes climate resilience policies that are most relevant to San Joaquin County jurisdictions:
- **SB 1000:** Passed in 2016, amends Government Code Section 65302 to require General Plans to include an Environmental Justice element,"[49]
- **SB 246:** Passed in 2015, established the Integrated Climate Adaptation and Resiliency Program to coordinate regional and local climate adaptation strategies.[50]
- **SB 379:** Passed in 2015, SB 379 "requires all cities and counties to include climate adaptation and resiliency strategies in the Safety Elements of their General Plans."[51] See the Regional Adaptation Resources section and Appendix D for more information.

[49] Leyva. (2016). SB-1000 Land use: general plans: safety and environmental justice. https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201520160SB1000
[50] Wieckowski. (2015). SB-246 Climate change adaptation. https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201520160SB246
[51] Jackson. (2015). SB-379 Land use: general plan: safety element. https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201520160SB379

- **SB 5:** Passed in 2007, SB 5 mandates that cities and counties within the Sacramento-San Joaquin Valley amend their general plans to include analysis from the Central Valley Flood Protection Plan and build to a 200-year level of flood protection for urbanized or urbanizing areas by 2025. SJAFCA is working to meet this legislation in the San Joaquin Region through its levee improvement projects.[52],[53]

Table 5: List of California Climate Legislation

TYPE	TITLE	SUMMARY
Other	Climate Action Bills	On September 23, 2021, Governor Newsom highlighted over $15 billion in funding toward climate action. With this declaration he signed 25 related bills.
Executive Orders	EO N-82-20	2020, Directs state agencies to deploy strategies to sequester carbon in the state's natural and working lands, and to conserve 30 percent of the state's land and coastal water by 2030.
	EO N-79-20	2020, Set a date for California State Transportation Agency (CalSTA) to identify near term actions, and investment strategies, to improve clean transportation, sustainable freight, and transit options,
	EO N-19-19	2019, Requires the Department of Finance to develop a framework that ensures that the state's investment portfolio aligns responsibly with industries that reduce GHG emissions and build resilience to climate change. Requires CalSTA to leverage $5 billion annual state transportation spending to lower fuel consumption and reduce GHG impacts from the transportation sector.
	EO N-05-19	2019, To provide recommendations on wildfire prevention and mitigation, including at-risk populations
	EO B-54-18	2018, Safeguarding California plants, wildlife, and ecosystems from climate change
	EO B-52-18	2018, To Improve Forest and community resilience to wildfire and other climate impacts
	EO B-37-16	2016, Making water conservation a way of life; "builds on temporary statewide emergency water restrictions"
	EO B-30-15	2015, Establishing 2030 CA emissions target, adaptation initiatives (40% below 1990 levels)
	EO S-13-08	2008, "requires the California Natural Resources Agency to develop a state Climate Adaptation Strategy in coordination with local, regional, state and federal public and private entities"
	EO S-03-05	2005, EPA must report to the Governor on the impacts of global warming every 2 years
Assembly Bills	AB-65	2019, "requires the State Coastal Conservancy to prioritize funding coastal projects that use natural infrastructure in in support of coastal climate change adaptation"
	AB 3012	2018, State Coastal Conservancy, grants, climate change projects
	AB 1668	2018, Water Management Planning (contingent on SB 606, both response to B-37-16)
	AB 733	2017, Authorized "creation of enhanced infrastructure financing districts for climate adaptation projects"
	AB 2800	2016, "ensure that the planning and design of state infrastructure projects consider future climate change impacts"
	AB 2722	2016, Transformative Climate Communities program; fuel development of "development of "transformative" climate community plans"
	AB 2139	2016, Ocean Protection Council for ocean acidification and hypoxia
	AB 1482	2015, "requires the California Natural Resources Agency (CNRA), in coordination with the Strategic Growth Council, to oversee and coordinate state agency actions to adapt to climate change"
	AB 693	2015, Solar on Multifamily Affordable Housing (SOMAH) Program and the Multifamily Affordable Housing Solar Roofs Program (MASH)
	AB 2516	2014, Planning for Sea Level Rise Database

[52] Senator Machado. (2007). SB 5. Flood management. http://www.leginfo.ca.gov/pub/07-08/bill/sen/sb_0001-0050/sb_5_bill_20071010_chaptered.html
[53] San Joaquin Area Flood Control Agency. (2019). *Strategic Plan.* https://www.sjafca.org/home/showpublisheddocument/933/637486408308130000

	AB 296	2012, California Cool Pavements Research and Implementation Act
	AB 691	2013, "this law will prepare California for the impacts of sea level rise by requiring holders of public trust lands to assess the impacts and report the results to the State Lands Commission."
Senate Bills	SB 901	2018, Wildfire Preparedness and Response
	SB 1072	2018, Regional Climate Collaborative Program, technical assistance
	SB 606	2018, Water Management Planning, drought resilience
	SB 667	2017, Department of Water Resources, riverine and riparian stewardship improvements; support projects that reduce flood risk
	SB 1000	2016, "requires cities and counties of California to include an Environmental Justice element in their General Plans"
	SB 246	2015, "coordinate regional and local efforts with state climate adaptation strategies to adapt to the impacts of climate change"
	SB 379	2015, "requires all cities and counties to include climate adaptation and resiliency strategies in the Safety Elements of their General Plans"
	SB 535	2012, California Global Warning Solutions Act; GHG reduction fund, benefits to disadvantaged communities from GGRF fund
	SB 1066	2012, Climate Ready California Coastal Conservancy; "uses entrepreneurial techniques to purchase, protect, restore, and enhance coastal resources"
	SB 1006	2010, California Strategic Growth Council to incorporate adaptation
	SB 732	2008, Creation of Strategic Growth Council – responsible for coordinating activities of state agencies
	SB 5	2007, mandates a 200-year level of flood protection for urbanized or urbanizing areas by 2025.

Funding

An influx of state climate change resilience funding is coming through Governor Newsom's $15 billion Climate Resilience Package.[54] Some of the largest investments will be directed towards wildfire resilience and forest health, water conservation and drought resilience, climate smart agriculture, and zero emission vehicle infrastructure.[55] Some of the key funding opportunities for SJCOG and its San Joaquin region partners include the following, as provided in the final Governor's budget summary:

- Drought resilience and response
    - "Water Conservation Programs—$180 million for grants to large urban and small water suppliers to improve water efficiency, address leaks, reduce demand, provide water use efficiency-related mapping and training, support turf replacement, and maintain a drought vulnerability tool. These investments advance water conservation as Californians work to achieve the Governor's 15-percent voluntary water conservation target and as local water districts adapt to forthcoming efficiency standards.
    - Urban and Small Community Drought Relief—$145 million for local emergency drought assistance and grants to local water agencies facing loss of water supplies.
    - Fish and Wildlife Protection—$75 million to mitigate immediate drought damage to fish and wildlife resources and build resilience of natural systems.

[54] Office of Governor Gavin Newsom. (2021). Governor Newsom Signs Climate Action Bills, Outlines Historic $15 Billion Package to Tackle the Climate Crisis and Protect Vulnerable Communities. https://www.gov.ca.gov/2021/09/23/governor-newsom-signs-climate-action-bills-outlines-historic-15-billion-package-to-tackle-the-climate-crisis-and-protect-vulnerable-communities/
[55] Office of Governor Gavin Newson. (2022). *Governor's Budget Summary.* https://www.ebudget.ca.gov/FullBudgetSummary.pdf

- Multibenefit Land Repurposing—$40 million to increase regional capacity to repurpose irrigated agricultural land to reduce reliance on groundwater while providing community health, economic well-being, water supply, habitat, renewable energy, and climate benefits.
- Groundwater Recharge—$30 million to provide grants to water districts to fund planning, engineering, water availability analyses, and construction for groundwater recharge projects.
- On-Farm Water Conservation—$20 million to bolster the State Water Efficiency and Enhancement Program, which provides grants to implement irrigation systems that save water on agricultural operations.
- Technical Assistance and Drought Relief for Small Farmers—$10 million to provide mobile irrigation labs, land use mapping and imagery, irrigation education, and direct assistance to small farmers and ranchers who have experienced water cost increases of more than 50 percent.
- Drought Contingency—$250 million as a drought contingency set aside to be allocated as part of the spring budget process, when additional water data will be available to inform additional drought needs."[56]

- Extreme heat
  - "Urban and Community Forestry and Urban Greening—$100 million to cool communities through nature-based solutions, such as expanding tree canopy and green infrastructure projects.
  - Community Resilience and Heat Program—$25 million to reduce the impacts of extreme heat and the urban heat island effect.
  - Community Resilience Centers Program—$25 million to support vulnerable residents experiencing extreme heat, wildfires, power outages, flooding, and other emergency situations brought about by the climate crisis.
  - Low-Income Weatherization Program—$25 million to accelerate energy efficient upgrades in low-income households through, for example, accelerated deployment of air conditioning heat pumps and low global warming potential refrigerants in communities particularly vulnerable to heat."[57]

- Nature-based solutions
  - The 2021 Budget committed $1.4 billion one-time General Fund over three years for multi-benefit nature-based solutions, which include:
    - Drought response
    - Improved resilience to forests and wildlands
    - Multi-benefit solutions that combat climate change, protect biodiversity, and expand outdoor access
    - Community greening
    - Support for climate smart agriculture
    - Coastal restoration projects
    - Community economic resilience funding
  - The 2021 Budget also included $768 million one-time General Fund over two years to support implementation of the state's Natural and Working Lands Climate Smart Strategy, which may result in funds towards the following efforts:

[56] Office of Governor Gavin Newson. (2022). *Governor's Budget Summary.* https://www.ebudget.ca.gov/FullBudgetSummary.pdf
[57] Ibid.

- Support for varying types of habitat restoration projects
- Expanded regional technical assistance and capacity building
- Increased workforce development and training through the California Conservation Corps and others
- Partner with Tribes to implement nature-based solutions
- Support strategic investments that meet the goals of the Natural and Working Lands Climate Smart Strategy

- Community resilience
  - "Transformative Climate Communities Program—$165 million to support catalytic projects that serve as a model for equitable, community-driven infrastructure investments in the most disadvantaged communities of California.
  - Regional Climate Collaboratives and Resilience—$135 million to provide direct investment in communities through capacity building grants, tribal, local and regional adaptation planning, and implementation of resilience projects.
  - California Climate Action Corps—$4.7 million ongoing to empower Californians to take climate action through service positions, volunteer opportunities, or individual action."[58]
- Climate smart agriculture
  - "Funding Agricultural Replacement Measures for Emission Reductions Program (FARMER)—$150 million to provide funding that supports the replacement of equipment used in agricultural operations.
  - Healthy Soils Program—$85 million to provide grants for on-farm conservation management practices designed to sequester carbon within the soil.
  - Livestock Methane Reduction—$48 million for livestock methane reduction programs.
  - Climate Catalyst Fund—$25 million to support Climate Smart Agriculture loans.
  - Technical Assistance and Conservation Management Plans—$22 million to fund technical assistance grants for the development of conservation plans, carbon sequestration plans, and transition to organic plans to focus on carbon and water actions.
  - Pollinator Habitat Program—$15 million for implementation of pollinator habitat and forage on working lands in partnership with private landowners and federal, state, and local entities."[59]

CO-BENEFITS

Co-benefits are the additional benefits that may stem from a single adaptation strategy, which positively influence the surrounding community and social equity, natural resources, GHG mitigation, and/or the local economy. SJCOG took into consideration the importance of co-benefits of different implementation strategies by accounting for the following benefits in the strategy prioritization process:

- GHG reductions
- Local environmental benefits (e.g., improved regional air quality, water quality, habitat)
- Community health and safety benefits (e.g., to public health, safety, Urban Heat Island mitigation)

[58] Office of Governor Gavin Newson. (2022). *Governor's Budget Summary.* https://www.ebudget.ca.gov/FullBudgetSummary.pdf
[59] Ibid.

- Disadvantaged community needs and benefits (e.g., to health and safety, improved mobility, and access to transportation options)
- Improvements to transportation system (e.g., efficiency, redundancy, access, transit/active transportation options)

Because of the project's emphasis on equity and supporting adaptation needs of disadvantaged communities, that co-benefit was weighted higher than the others. These are just a few of the examples of co-benefits of adaptation projects. Natural infrastructure projects provide many different co-benefits by reducing GHGs, providing environmental benefits, and providing community benefits as well by enhancing the beauty of neighborhoods or even by creating space for public recreation.

UNDERSTANDING CONSEQUENCES OF DESIGN CRITERIA EXCEEDANCE

Transportation assets are often designed to withstand certain historical design events or similar standards. For example, the rail of a commuter rail system is stressed to a certain temperature based upon historical low and high temperatures in the area (called the "zero stress temperature"). Or a culvert is designed to a historical storm event (e.g., 50-year event). A design event is selected based on the risk tolerance for the asset. An agency with a relatively low risk tolerance for an asset, meaning that the asset is critical and/or damage would be catastrophic, would typically use a low probability and therefore higher magnitude design event (e.g., a 500-year event).

Transportation systems can be made more resilient by understanding the consequences of exceeding an asset's design event, whether that event is a storm event, temperature range, or other hazard. Understanding consequence involves first understanding the magnitude of hazard event that could damage the asset and how the asset itself could be affected, including damage and disruption costs associated with those magnitudes. Consequence information can be used during the design process before an asset is put in place and later in an asset's lifecycle during operations and maintenance.

REGIONAL ADAPTATION RESOURCES

SJCOG has progressed a selection of top priority, near-term implementation strategies which provide SJCOG's member jurisdictions and stakeholders with additional guidance and resources to implement regional adaptations. The sections below summarize SJCOG work to-date on each strategy and the resources produced to-date. See the Appendix for the complete set of resources.

PATHWAYS TO CREATE A REGIONAL CLIMATE COLLABORATIVE

RCCs have emerged as an effective model for inclusive cross-agency, cross-sector coordination. For this reason, SJCOG is considering several different options for creating or joining an RCC, to share best practices, lessons learned, resources, and collaborate on regional implementation strategies with cross-sector stakeholders.

In 2018, California passed Senate Bill (SB) 1072, which establishes an RCC program administered by the Strategic Growth Council (SGC). The purpose of the program is to assist under-resourced communities to access funding for climate mitigation and adaptation through the collaboratives.[60] Several regional collaboratives have already been established throughout California and are coordinated by the Alliance of Regional Collaboratives for Climate Adaptation (ARCCA), a coalition of the nonprofit organization the Local Government Commission (LGC).[61] These collaboratives represent several large regions in California, but none of them represent SJCOG's region. Given that the Strategic Growth Council received $20 million as part of the Governor's 2021 Budget to implement the program, SJCOG has an opportunity to develop a sustainable RCC for the region.

The team identified several potential pathways for creation of a regional climate collaborative, as summarized in Table 4 below.

[60] State of California. (2018). SB-1072 Regional Climate Collaborative Program: technical assistance. https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180SB1072
[61] Alliance of Regional Collaboratives for Climate Adaptation. (2021). About ARCCA. https://arccacalifornia.org/about/

Table 6: San Joaquin County Regional Climate Collaboratives Opportunity Assessment

Pathway	Setup Process	Level of Staffing Support Required	Cost to SJCOG
Pathway 1: SJCOG Forms A New Regional Climate Collaborative	-Conduct needs assessment, form workgroup -Develop governance and communications processes, identify funding -Initiate workplan -Communicate outcomes -Setup regular meetings	One full-time staff person	$30-75K annually
Pathway 2: SJCOG Support Local Organization Formation of a Collaborative	-Identify participants and lead organization -Support application process -Optional: act as managing stakeholder (funds management) -Attend regular meetings	Part-time staff representative (can vary)	Membership fees ($1000-$4,000)
Pathway 3: SJCOG Joins an Existing Regional Climate Collaborative	-Coordinate with potential existing collaboratives -Identify best fit collaborative(s) to join -Attend regular meetings	Part-time staff representative (can vary)	Membership fees ($1000-$4,000)
Pathway 4: Continue Informal Collaboration / Not Form or Join an RCC	-Leverage existing interagency workgroups -Leverage existing public facing SJCOG committees	No change	None

Given the lack of representation for the region in the existing collaboratives and the track record of climate advocacy in the region, pathways 1 or 2 are recommended. Pathway 2 may be the more viable near-term option given that Rise Stockton is a well-established group that has received State climate grants in the past and represent key stakeholders of varying institution types in the region. This would also be less time and resource consuming for SJCOG. However, such a model would not afford as much control and would place SJCOG in a support role at times.

See Appendix C for a memorandum on RCCs and the four pathways SJCOG is considering.

TEMPLATE LANGUAGE FOR GENERAL PLANS – SENATE BILL 379 COMPLIANCE

SB 379 requires cities and counties to include climate adaptation and resilience strategies in the safety elements of their general plans on or before January 1, 2022 and update the element no less than every eight years after inclusion. The review and update of the safety element must include the following:

- **A vulnerability assessment** that identifies the threat that climate change poses to the local jurisdiction.
- A set of **adaptation and resilience goals, policies, and objectives** that is based upon the vulnerability assessment findings.

- A set of **implementation measures** which are designed to achieve adaptation and resilience goals, policies, and objectives.

To assist local jurisdictions, several regional organizations such as the Southern California Association of Governments (SCAG) and Fresno COG have developed SB 379 compliance guidance. Similarly, SJCOG developed template language for its member jurisdictions to incorporate into their general plan safety elements and is based on SJCOG's efforts to understand and respond to regional risks posed by climate change through its Climate Adaptation and Resiliency Study completed in 2020 and this Regional Resiliency Implementation Plan and Adaptation Guidance project.[62] This template language is available in full in Appendix D for member jurisdictions to use to supplement their general plan safety elements.

DEVELOP CLIMATE RESILIENCE METRIC(S) TO EVALUATE REGIONAL TRANSPORTATION PLAN PROJECTS

SJCOG is currently considering inclusion of a matrix to evaluate the overall RTP project list with metrics from SB1 studies. This allows SJCOG to evaluate all projects across a variety of funding sources, including some which may already have climate resilience criteria built in. SJCOG developed a set of potential metrics for inclusion in the project evaluation process to prioritize those that will contribute to the resilience of the region. The metrics can also be used to reflect negatively on projects which may worsen risks from climate change (e.g., a project proposed in a floodplain). See Appendix E for the complete resource.

CREATE PROJECT MANAGER GUIDANCE FOR REGIONAL TRANSPORTATION PLAN PROJECTS

To prepare the region's transportation infrastructure for future conditions and make sure that that it can withstand and rebound from the effects of climate hazards, project managers must integrate climate resilience considerations and an understanding of future climate conditions into project planning and design. SJCOG developed a project manager climate change considerations checklist to guide project managers through key climate change-related considerations when planning and designing projects with the goal of improving the resilience of future transportation projects and the region. See Appendix F for the complete resource.

[62] Referring to existing plans is acceptable for compliance with SB 379.

APPENDIX A – COMPLETE LIST OF REGIONAL IMPLEMENTATION STRATEGIES

Table 7: Condensed Version of the SJCOG Implementation Strategy Matrix

ID	Strategy	Effectiveness	Capital Cost	O&M Cost	Ease of local implementation	Timeframe for implementation	GHG reductions	Local environmental benefits	Community health and safety benefits	Disadvantaged community benefits	Improvements to transportation system	Score [63]
31	Create a Regional Climate Collaborative or committee to coordinate and implement responses to climate change. Cross-sector collaboration including public health, community-based organizations (CBOs), Climate Action Corps, and private sector.	High	Low	Low	High	Near-term	Yes	Yes	Yes	Yes	No	87%
55	Develop a Regional Emergency Response Plan which integrates the region's transit operators and their role in a mass evacuation event.	High	Medium	Low	Medium	Near-term	No	No	Yes	Yes	Yes	84%
53	Conduct a flood adaptation assessment for SR-4 from Stockton west to Contra Costa County flood, considerate of evacuation planning.	High	High	Medium	Medium	Medium-term	No	No	Yes	Yes	Yes	81%
22	Continue critical projects in progress by the San Joaquin Area Flood Control Agency (SJAFCA). Advance the Lower San Joaquin River Feasibility Study.	High	High	High	High	Near-term	No	No	Yes	Yes	No	80%
45	Develop climate resilience metrics to evaluate 2022 RTP/SCS project list and overall prioritization.	High	Low	Low	High	Near-term	No	No	Yes	No	Yes	79%

[63] Score is out of 100%.

ID	Strategy	Effectiveness	Capital Cost	O&M Cost	Ease of local implementation	Timeframe for implementation	GHG reductions	Local environmental benefits	Community health and safety benefits	Disadvantaged community benefits	Improvements to transportation system	Score [63]
50	Conduct a flood adaptation assessment for SR-99 through Lodi, considerate of evacuation planning.	High	High	Medium	Medium	Medium-term	No	No	Yes	Yes	Yes	79%
51	Conduct a flood adaptation assessment for South Stockton including roads, transit stops, and rail.	High	High	Medium	Medium	Medium-term	No	No	Yes	Yes	Yes	79%
49	Conduct a flood adaptation assessment for Waterloo Road/CA-88, considerate of evacuation planning.	High	High	Medium	Medium	Medium-term	No	No	Yes	Yes	Yes	79%
32	Execute a public education campaign to ensure that the broader public understands climate change projections, impacts, and adaptation strategies, and the terminology surrounding these topics. There have been good efforts through the Office of Emergency Services to list information on their website about potential risks. This could be taken a step further with public campaigns or explicit partnerships with organizations. The public education campaign should include information about evacuation prep, the act of evacuating, and returning home.	High	Low	Low	High	Medium-term	No	No	Yes	Yes	No	77%

ID	Strategy	Effectiveness	Capital Cost	O&M Cost	Ease of local implementation	Timeframe for implementation	GHG reductions	Local environmental benefits	Community health and safety benefits	Disadvantaged community benefits	Improvements to transportation system	Score [63]
11	Provide better communication services in emergencies. Communications should be offered in multiple languages and formats (e.g., social media, text alerts, phone calls).	High	Low	Low	Medium	Medium-term	No	No	Yes	Yes	No	77%
37	Develop back up power strategies to ensure that electric transit can still provide regular service or assist in evacuation when there are outages.	High	Medium	Medium	High	Long-term	No	No	Yes	Yes	Yes	75%
21	Continue SJAFCA Mossdale Tract (Reclamation District 17) area adaptation assessment (SJAFCA and DWR already evaluating options). Flooding here could affect I-5, I-205 and potentially SR-120. Includes portions of Lathrop, Manteca, Stockton, and San Joaquin County.	High	High	High	Medium	Medium-term	No	No	Yes	Yes	No	75%
48	Provide comprehensive backup power at Port of Stockton during outages.	High	Medium	High	High	Near-term	No	No	No	No	Yes	74%
17	Update design criteria and guidance for infrastructure projects to address climate change. Including Caltrans Highway Design Manual.	High	Low	Low	High	Near-term	No	No	No	No	Yes	74%
40	Assess flood mitigation for City of Stockton public housing in floodplain.	High	Medium	Medium	Medium	Medium-term	No	No	Yes	Yes	No	74%

ID	Strategy	Effectiveness	Capital Cost	O&M Cost	Ease of local implementation	Timeframe for implementation	GHG reductions	Local environmental benefits	Community health and safety benefits	Disadvantaged community benefits	Improvements to transportation system	Score [63]
29	Identify dedicated funding sources are needed to support regional climate change work including implementation of adaptation strategies. Existing funding sources need to be more flexible for adaptation projects.	High	High	Medium	Low	Long-term	Yes	Yes	Yes	Yes	Yes	73%
20	Advance SJAFCA Smith Canal Project (currently under construction).	High	High	High	High	Near-term	No	No	Yes	Yes	No	72%
52	Conduct a Stockton Wye flood adaptation assessment.	High	High	Low	Medium	Medium-term	No	No	No	No	Yes	72%
54	Conduct a BNSF Intermodal Railyard (Stockton) flood adaptation assessment.	High	High	Low	Medium	Medium-term	No	No	No	No	Yes	72%
4	Create a free shade tree program. Regional nonprofits (like Promotores Unidas para Educacion Nacional de Tecnologias Sostenibles (PUENTES)) and stakeholders could provide funding for free shade trees for homeowners/business owners to plant trees alongside roadways and sidewalks. Regional nonprofits to administer the program.	Medium	Low	Low	High	Medium-term	Yes	Yes	Yes	Yes	No	69%

ID	Strategy	Effectiveness	Capital Cost	O&M Cost	Ease of local implementation	Timeframe for implementation	GHG reductions	Local environmental benefits	Community health and safety benefits	Disadvantaged community benefits	Improvements to transportation system	Score [63]
33	Identify and provide outreach funding, such as stipends for volunteers, students, or other professionals to participate in meetings. Providing incentives to contribute will ensure a diverse range of perspectives (not just from subject matter experts and professionals working in the field).	High	Medium	Medium	Medium	Medium-term	No	No	No	Yes	No	68%
7	Expand bus routes and hours with increased frequency and reliability, particularly in Disadvantaged Communities such as South Stockton.	Medium	Medium	Medium	High	Near-term	Yes	Yes	Yes	Yes	Yes	68%
24	Develop template language to address climate change impacts via local code updates (building code, zoning code, local ordinances) including for design strategies such as green/cool roofs to mitigate UHI.	High	Low	Low	Medium	Medium-term	No	No	No	No	No	65%
19	Implement regionally coordinated levee raising projects to ensure the entire system is high enough for future flows. (Can include coordination with DSC Delta Levee Investment Strategy.)	High	High	Medium	Low	Long-term	No	No	Yes	Yes	No	64%

ID	Strategy	Effectiveness	Capital Cost	O&M Cost	Ease of local implementation	Timeframe for implementation	GHG reductions	Local environmental benefits	Community health and safety benefits	Disadvantaged community benefits	Improvements to transportation system	Score [63]
3	Local jurisdictions to plant more trees along roadways and sidewalks, particularly in urban areas such as Stockton and neighborhoods with limited investments in tree canopies like South Stockton.	Medium	Medium	Medium	Medium	Medium-term	Yes	Yes	Yes	Yes	Yes	63%
6	Provide more comfortable, shaded transit stops, especially in Disadvantaged Communities such as South Stockton.	Medium	Medium	Low	Medium	Medium-term	No	No	Yes	Yes	Yes	61%
1	Develop template language about climate change impacts and responses for General Plans (for compliance with SB 379).	Medium	Low	Low	High	Near-term	No	No	Yes	Yes	Yes	60%
35	Make regional investment in smart grids, microgrids, solar, and/or community power to improve energy reliability.	Medium	High	Low	Medium	Near-term	Yes	Yes	Yes	Yes	No	56%
10	Provide free transit to cooling centers on hot days.	Medium	Low	Low	High	Near-term	No	No	Yes	Yes	No	55%
36	Keep N95 masks in stock and available as needed for wildfire season - distribute for free to community.	Medium	Low	Low	Medium	Near-term	No	No	Yes	Yes	No	52%
56	Create project manager guidance for SCS/RTP project managers to consider climate risks in the planning and design phases of projects identified as vulnerable to one or more climate hazards.	Medium	Low	Low	High	Near-term	No	No	No	No	Yes	51%

ID	Strategy	Effectiveness	Capital Cost	O&M Cost	Ease of local implementation	Timeframe for implementation	GHG reductions	Local environmental benefits	Community health and safety benefits	Disadvantaged community benefits	Improvements to transportation system	Score [63]
23	Identify the best practices or projects that other cities/counties are conducting in terms of responses to wildfires, evacuations, flood events.	Medium	Low	Low	High	Near-term	No	No	No	No	No	47%
25	Create one platform or clearinghouse for climate change information and best practices for adaptation. Potential to coordinate with DSC on this.	Medium	Low	Low	High	Near-term	No	No	No	No	No	47%
2	Develop climate resiliency policy template language. This could go into the 2022 RTP/SCS and be used as template language around climate change by local jurisdictions and partner agencies.	Medium	Low	Low	High	Near-term	No	No	No	No	No	45%
39	Conduct a flood adaptation assessment for Corral Hallow (including mudslides, erosion, wildfire; evacuation challenges; bridge capacity issues).	Medium	Medium	Medium	Medium	Near-term	No	No	Yes	No	Yes	45%
12	Expand on-demand transit (paratransit).	Low	Medium	Medium	High	Medium-term	Yes	Yes	Yes	Yes	Yes	35%
15	Provide additional Electric Vehicle charging stations across the region.	Low	Medium	Low	Medium	Long-term	Yes	Yes	Yes	Yes	Yes	32%
8	Assess designated and "informal" trucking routes that may have disproportionate impacts to neighboring communities.	Low	Low	Low	Medium	Medium-term	Yes	No	Yes	Yes	No	30%
9	Deploy a low emissions car share program.	Low	Medium	Medium	Low	Medium-term	Yes	Yes	Yes	Yes	Yes	30%

ID	Strategy	Effectiveness	Capital Cost	O&M Cost	Ease of local implementation	Timeframe for implementation	GHG reductions	Local environmental benefits	Community health and safety benefits	Disadvantaged community benefits	Improvements to transportation system	Score [63]
14	Make rail improvements to existing infrastructure (e.g., electrification, grade separation).	Low	High	Medium	Low	Long-term	Yes	Yes	Yes	Yes	Yes	29%
38	Provide free water for active transportation users.	Low	Medium	Low	High	Near-term	No	No	Yes	Yes	No	27%
13	Provide more efficient and accessible rail service. Improve connections to rail options like Valley Link, Amtrak, and ACE.	Low	High	High	Low	Long-term	Yes	Yes	Yes	Yes	Yes	26%
34	Provide green business job training.	Low	Medium	Medium	Medium	Near-term	Yes	Yes	No	Yes	No	26%
42	Understand increasing lifecycle pavement costs and evaluate new pavement technologies and designs.	Low	Low	Low	High	Near-term	No	No	No	No	Yes	24%
47	Improve landscaping along highways, especially near disadvantaged communities, to provide shade, increase albedo and mitigate UHI, reduce noise from traffic, and improve views. Use of drought-tolerant and native landscaping is preferred to reduce water use.	Low	Medium	Medium	Medium	Long-term	Yes	Yes	No	Yes	No	21%
43	Reconfigure bridge piers to reduce restriction of flow. Other bridge improvements to increase freeboard and reduce risk of scour.	Low	High	Low	Medium	Medium-term	No	No	No	No	No	10%

APPENDIX B – PRIORITIZATION METHODOLOGY

This memorandum summarizes how the San Joaquin Council of Governments (SJCOG) has prioritized implementation strategies in the San Joaquin region, which will be used to increase the resilience of the regional transportation network in the face of climate change. This is a critical step in the SJCOG work to develop a San Joaquin Regional Resiliency Implementation Plan and Adaptation Guidance document for the San Joaquin County transportation system and its users.

SJCOG and the project team developed a Regional Needs Assessment which provides a complete list of regional needs and barriers to addressing climate impacts, past impacts and problem areas on the transportation network, and implementation and adaptation strategies, as collected through stakeholder and community engagement. The Regional Needs Assessment identified an initial set of implementation strategy ideas and established stakeholder needs/goals for increasing regional resiliency.

A total of 56 implementation strategies were compiled and ranked in a "Strategy Evaluation Matrix." This technical memorandum, or "Prioritization Protocol," summarizes the methodology for how the strategies were ranked, to identify the highest priority strategies for implementation in the region. To sort through the different strategies, a set of consistent criteria were needed to compare strategies against one another. These criteria center around the implementation strategy benefits (e.g., risk reduction) and any challenges to implementation (e.g., cost), so that SJCOG and its stakeholders can make informed decisions about which strategies to prioritize.

See the Strategy Evaluation Matrix for a complete list of implementation strategies and their rankings (Appendix A).

IMPLEMENTATION STRATEGY EVALUATION CRITERIA

These criteria were used to evaluate the implementation strategies and support strategy prioritization for the San Joaquin region:

- Alignment with Phase I study:
    - Addresses vulnerabilities at a Phase I priority facility/location (e.g., South Stockton, Stockton Airport, SR 4 from Stockton West to Contra Costa).
    - Addresses vulnerabilities for a critical transportation asset, as identified in the Phase I study using the following criteria:
        - Bus route density
        - Key supporting services
        - Goods movement connectors
        - Access points for transportation-disadvantaged, rural populations
        - Access to transit for transportation-disadvantaged, urban populations
        - Evacuation routes operating at a low level of service
        - Transport via deep-water port and air
- Effectiveness:
    - Physical risk reduction OR resilience capacity building:
        - Physical risk reduction will be evaluated as a criterion for projects that would make a physical improvement to the transportation network or address a site-specific vulnerability. For example, raising or improving a levee would reduce the risk of flooding.
        - Resilience capacity building will be evaluated as a criterion for policy-level strategies, or those that would have a broader impact to help the San Joaquin region prepare for climate impacts. For example,

instituting a new tax to fund levee improvement projects would help build capacity needed to mitigate flood risk.

- Relative cost of implementation:
    - Capital cost, or upfront costs of completing a project (e.g., high cost)
    - Operations and maintenance (O&M) cost (including staffing requirements) (e.g., low cost)
- Streamlining implementation:
    - Ease of local implementation (by local/regional entities)
    - Timeframe for implementation (e.g., near, mid, or long term)
    - Alignment with existing projects and funding
- Co-benefits:
    - Greenhouse gas (GHG) reductions
    - Local environmental benefits (e.g., improved regional air quality, water quality, habitat)
    - Community health and safety benefits (e.g., to public health, safety, Urban Heat Island mitigation)
    - Disadvantaged community needs and benefits (e.g., to health and safety, improved mobility, and access to transportation options)
    - Improvements to transportation system (e.g., efficiency, redundancy, access, transit/active transportation options)

While not a criterion to be used in prioritization, the Strategy Evaluation Matrix also notes *who* is responsible for implementation of each strategy. This could be SJCOG, one of its member jurisdictions, or other regional stakeholders such as the Stockton Metropolitan Airport or the San Joaquin Area Flood Control Agency.

PRIORITIZATION PROTOCOL

SCORING METHODOLOGY

This information feeds into a weighted criterion scoring methodology. Each implementation strategy is evaluated against a consistent set of criteria. Each strategy receives a score for each criterion. For example, each strategy is assigned a score of low, medium, or high for the "ease of implementation" criterion. These low, medium, and high scores are scaled between 0%, 50%, and 100%, respectively. So, a strategy that is very easy to implement would receive a full scaled score of 100%.

Each criterion also has a weight tied to it based upon SJCOG's priorities. Criteria with higher weights are considered relatively more important. The weights are given as percentages and the sum of all these weights adds up to 100%.

These weights are multiplied by the scaled scores. Then, they are added together to obtain an overall score. This score can then be used to rank each strategy.

The steps to the scoring methodology are provided in more detail below:

1. **Identify common scoring formats and scale for implementation strategy criteria:** There are different ways to measure the evaluation strategy criteria identified above (e.g., dollars, periods of time), which needed to be compared on a common scale for the sake of the scoring exercise. For this project, the project team used simple, categorical scores, particularly given the range of different strategy types being compared. The project team identified scoring formats for each implementation strategy criterion and a common scale for ranking strategies.

The scoring formats were used to compare and score criteria across different strategies in a simple way. For example, when evaluating the timeframe for implementation a "near, mid, or long-term" scoring format was used. This is compared against the same criterion for other strategies and can be scored rather simply; a strategy that can be implemented in the "near-term" will receive a higher score than one with a "long-term" timeframe for implementation.

The project team has decided to use a simple 0%, 50%, or 100% scale for each of the criteria. For criteria that have a simple "yes or no" scoring format, the associated score is 100% or 0%. For criteria with "low to high" scoring format, the associated scores would be 0%, 50%, to 100%.

2. **Apply weights:** Some criteria were identified as more important than others for determining overall priorities. Therefore, the relative importance of each scaled score was adjusted by multiplying the score by a weighting factor. Criteria deemed more important to prioritization were multiplied by a larger weight (e.g., a 30% weight is more important than a 5% weight).
3. **Calculate prioritization scores for each strategy:** After the weights were applied, the final step was to calculate prioritization scores for each implementation strategy. This was accomplished by first summing the products of the weights and scores for all the criteria relevant to the strategy. The final values were scaled on a range from 0% to 100%, with 0% representing the lowest priority strategy and 100% the highest priority strategy. So, each strategy would receive a final score out of 100% which was used to compare strategies to one another.
4. **Organize.** The final step was to sort the matrix by overall priority. Each strategy received an associated ranking with its score (1 through 46). There are 56 strategies total, but some strategies have the same final ranking due to having received the same overall score.

   The project team created two final strategy rankings: one that ranked all implementation strategies and one that only ranked the near-term, easy to implement strategies.

See Table 8 for the approach to scoring and weighting the implementation criteria, which was applied in the final Strategy Evaluation Matrix. The overall rationale for the weights is as follows. Effectiveness was assumed to be the most important criteria group and so was assigned 50% of the overall weight. The remaining 50% was split between co-benefits (total of 20%) and implementation considerations (alignment with Phase 1, relative cost of implementation, and streamlining implementation have a combined total of 30%). Because of the project's emphasis on equity and supporting adaptation needs of disadvantaged communities, that co-benefit was weighted higher than the others.

Table 8: Implementation Strategy Evaluation Criteria, Scores, and Weights

#	Evaluation Criteria	Scoring Format	Scaled Score	Weight (Physical Risk Reduction Strategies)	Weight (Resilience Capacity Building Strategies)
Alignment with Phase I priorities					
1	Addresses vulnerabilities at a Phase I priority facility/location	Yes/No	100% or 0%	4%	4%
2	Addresses vulnerabilities for a Phase I critical transportation asset	Yes/No	100% or 0%	4%	4%
Effectiveness					
3	Physical risk reduction	"Low, medium, high" risk reduction (high is better)	0%, 50%, or 100%	50%	NA
4	Resilience capacity building	"Low, medium, high" likelihood of impact (high is better)	0%, 50%, or 100%	NA	50%
Relative cost of implementation					
5	Capital cost (upfront costs of completing a project)	"Low, medium, high" cost of implementation (low is better) Low = likely would cost thousands of dollars Med = likely would cost hundreds of thousands of dollars High = likely would cost millions of dollars	0%, 50%, or 100%	5%	5%
6	Operations and maintenance (O&M) cost (including staffing requirements)	"Low, medium, high" cost of implementation (low is better) Low = likely would cost thousands of dollars Med = likely would cost hundreds of thousands of dollars High = likely would cost millions of dollars	0%, 50%, or 100%	5%	5%
Streamlining implementation					

#	Evaluation Criteria	Scoring Format	Scaled Score	Weight (Physical Risk Reduction Strategies)	Weight (Resilience Capacity Building Strategies)
7	Ease of local implementation (by local/regional entities)	"Low, medium, high" ease of implementation (high is better)	0%, 50%, or 100%	5%	5%
8	Timeframe for implementation (near, mid, or long term)	"Near, mid, or long term" timeframe for implementation (near term is better) Near term = within 1-3 years Mid term = within 3-10 years Long term = greater than 10 years	0%, 50%, or 100%	5%	5%
9	Alignment with existing projects and funding	Yes/No	100% or 0%	2%	2%
Co-benefits					
10	GHG reductions	Yes/No	100% or 0%	3.5%	3.5%
11	Local environmental benefits (e.g., improved regional air quality, water quality, habitat)	Yes/No	100% or 0%	3.5%	3.5%
12	Community health and safety benefits (e.g., to public health, safety, Urban Heat Island mitigation)	Yes/No	100% or 0%	3.5%	3.5%
13	Disadvantaged community benefits (e.g., to health and safety, improved mobility, and access to transportation options)	Yes/No	100% or 0%	6%	6%
14	Improvements to transportation system (e.g., efficiency, redundancy, access, transit/active transportation options)	Yes/No	100% or 0%	3.5%	3.5%
Total				100%	100%

STAKEHOLDER INPUT

The final prioritization protocol was informed through stakeholder input. The Vulnerability Assessment Working Group (VAWG) reconvened August 31, 2021 to hold its second workshop. SJCOG used this workshop to collect feedback on the implementation strategies and if any were missing or should be modified, which scoring criteria are the most critical to consider, and the weighting of different criteria in the overall prioritization.

The VAWG was also sent the Strategy Evaluation Matrix for review and given a few weeks following the meeting to provide additional comments.

Here are the key comments and responses that came out of Workshop #2:

- Comment: Define the timeframe for implementation: near, mid, and long term
    - Response: Defined timeframe for implementation as follows:
        - Near-term = within 1-3 years
        - Mid-term = within 3-10 years
        - Long-term = greater than 10 years
- Comment: The top implementation strategy at the time of the workshop was relayed to tree planting on private property. A couple VAWG members noted that this seemed to score too highly compared to other strategies, especially when considering that it is only indirectly related to transportation.
    - Response: Changed the physical risk reduction score to "Medium" for all strategies relating to UHI and heat health events.
- Comment: Third City Coalition noted that they are working with community members and the City of Stockton's Community Service Department to identify opportunities to teach people how to swim and be safe in a flood emergency.
    - Response: Changed public education campaign strategy (#32) to include information on emergency response and evacuation preparation.
- Comment: SJCOG noted that some jurisdictions have thought about using water taxis in the event of a mass evacuation.
    - Response: Added a strategy to the matrix related to use of transit in an evacuation (#55).
- Comment: Could SJCOG develop a procedure or checklist for cities and/or the county which could be used to assess environmental consequences to projects.
    - Response: Added a strategy to the matrix "Create a project manager guidance/checklist for SCS/RTP project managers to consider climate risks in the planning and design phases of projects identified as vulnerable to one or more climate hazards" (#56).

See the SJCOG Phase II Study Workshop #2 notes attached with this technical memorandum for the complete set of comments received.

APPENDIX C – REGIONAL CLIMATE COLLABORATIVE PATHWAYS

BACKGROUND

Regional Climate Collaboratives (RCCs) have emerged as an effective model for inclusive cross-agency, cross-sector coordination. Several regions in Washington and Florida have set up RCCs, and California has established a statewide program. In 2018, California passed Senate Bill (SB) 1072, which establishes an RCC program administered by the Strategic Growth Council (SGC). The purpose of the program is to assist under-resourced communities to access funding for climate mitigation and adaptation through the collaboratives.[64]

Several regional collaboratives have already been established throughout California and are coordinated by the Alliance of Regional Collaboratives for Climate Adaptation (ARCCA), a coalition of the nonprofit organization the Local Government Commission (LGC).[65] These collaboratives represent several large regions in California, as shown in the below map. Though these collaboratives predate SB 1072, the bill language alludes to the ARCCA collaboratives and states that additional investments should support and leverage those efforts. Therefore, the below section identifies key themes and organization of existing collaboratives, with a subsequent overview of the emerging SGC-funded collaboratives and concluding with a list of recommendations for the San Joaquin Council of Governments (SJCOG).

[64] State of California. (2018). SB-1072 Regional Climate Collaborative Program: technical assistance. https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180SB1072

[65] Alliance of Regional Collaboratives for Climate Adaptation. (2021). About ARCCA. https://arccacalifornia.org/about/

Source: Alliance of Regional Collaboratives for Climate Adaptation, 2021.

REGIONAL CLIMATE COLLABORATIVES OVERVIEW

The below sections provide a consolidated summary of the existing RCCs in California as depicted in the above map. Though the age and purpose of each RCC varies, there are several key themes and similarities across them all, which provides a helpful roadmap of best practices and lessons learned.

ORGANIZATIONAL STRUCTURE & GOVERNANCE

Given that existing collaboratives have grown organically thus far under ARCCA, these collaboratives vary by region. However, the basic structure includes a diverse membership made up of organizations such as "local governments; other public agencies, regional authorities, and planning bodies; utilities; universities; nonprofit organizations; and private sector representatives."[66] As these collaboratives are overseen by a coalition of nonprofit organizations and include diverse non-governmental organizations, they do not hold any legal authority or jurisdictional decision-making power. With this open membership style, RCCs can act as convening spaces for a variety of discussions and engagements, particularly around collaboration on policy, planning, research, outreach, engagement, and funding for climate change action and adaptation.[67] Specific members within each RCC vary depending on the local context and climate goals; the Capital Region Climate Readiness Collaborative (CRC) in and around Sacramento membership includes small businesses, whereas the San Diego RCC includes several of the County's municipalities as well as the regional Metropolitan Planning Organization (MPO).[68]

While membership is often open and diverse, RCCs require a convening body or partner who can keep members engaged and participatory. While several collaboratives utilize a nonprofit host, others such as the Los Angeles and San Diego collaboratives utilize a university host. Additionally, collaboratives will include a leadership board that supports administration and direction of the organization. Though typically made up of a mix of member types, some collaboratives emphasize or require public agency participation, such as the San Diego RCC steering committee primarily made up of public agency staff.[69] However, other collaboratives steering committees or leadership councils represent the diversity of member types including nonprofits and industry in addition to local government.

FUNDING MODEL

As the existing collaboratives predate SB 1072 and the SGC program has gone unfunded until this upcoming year, collaboratives have had to come up with a variety of funding models to keep the organization afloat. Many of the collaboratives require membership dues, which are assessed regularly and modified depending on member type. The Sierra Camp collaborative has membership tiers for public agencies based on population size, whereas businesses and nonprofits are assessed by the number of employees; equity-focused and tribal organizations have a discounted membership rate.[70] Others such as the San Diego collaborative assess for-profit entity membership dues based on annual revenue.[71] In Los Angeles, individual students or professionals have discounted or slide scale dues.[72]

In addition to membership dues, regional collaboratives also receive or apply for funding from other sources such as philanthropic funds, government grants, and funding offered by utilities or regional agencies. The San Diego collaborative has been particularly successful at securing additional funding, having received continued support from the San Diego Foundation and San Diego Gas &

[66] State of California. (2018). SB-1072 Regional Climate Collaborative Program: technical assistance. https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180SB1072
[67] Alliance of Regional Collaboratives for Climate Adaptation. (2021). About ARCCA. https://arccacalifornia.org/about/
[68] Bennett, A., & Grannis, J. (2017). Lessons in Regional Resilience: Case Studies on Regional Climate Collaboratives. https://www.georgetownclimate.org/files/report/GCC-Lessons-in-Regional-Resilience-Synthesis-Jan_2017.pdf
[69] Ibid.
[70] Ibid.
[71] Ibid.
[72] Ibid.

Electric as well as grants from the National Oceanic and Atmospheric Administration (NOAA).[73] Finally, some collaboratives such as the CRC accept in-kind services instead of membership dues, particularly for local government entities.[74]

CASE STUDY: CAPITAL REGION CLIMATE READINESS COLLABORATIVE (CRC)

Given SJCOG's proximity to the CRC, a deeper dive into the history and status of CRC is outlined below to understand a geographically close region's model for climate change collaboration.

The CRC was formed in 2012 to address the region's most pressing climate hazards include flooding, drought, extreme heat, and wildfire, and includes the six counties of El Dorado, Placer, Sacramento, Sutter, Yolo, and Yuba.[75] Early members included the Sacramento Area Council of Governments (SACOG), the Sacramento Metropolitan Air Quality Management District (SMAQMD), and UC Davis, and since its formation, CRC has received financial and administration support from LGC.[76] As of today, CRC has 47 members, and the CRC's steering committee includes at least one representative from eight sectors: professional organizations, councils of government, municipalities, regulatory agencies & service providers, education, utilities, nonprofit organizations, and business, labor, and agriculture.[77] The CRC also utilizes an Executive Committee to oversee the Steering Committee and can establish ad-hoc committees as-needed, primarily to focus on funding opportunities and develop grant applications.

Regular meetings and communication are a key component of the CRC to keep members engaged and working towards regional climate goals. CRC leadership holds quarterly membership meetings to discuss relevant projects and initiatives as well as brainstorm strategic next steps for the region. In addition, CRC leadership and members conduct outreach to folks in the region for collaboration on key topics such as health and focuses on engaging small businesses as well. Lastly, newsletters are a key CRC communication tool to keep members up to date on emerging issues, news, funding opportunities.

STRATEGIC GROWTH COUNCIL REGIONAL CLIMATE COLLABORATIVES PROGRAM

The SGC program aims to fund collaboratives that can conduct capacity building activities to drive and sustain climate action in under-resourced communities within a defined region in the state that can access grants. Though SB 1072 passed in 2018, it has gone unfunded until recently. As part of the Governor's historic 2021 climate change budget package, SGC received $20 million to implement the program.[78] SGC has recently held several information sessions and webinars during the guideline development process to provide some initial program information and preliminary requirements.

GRANT PROGRAM REQUIREMENTS

The program guidelines development began in November 2021; SGC anticipates releasing a first draft in January 2022, with the final guideline's adoption anticipated for April 2022.[79] The program will include up to three rounds of funding, with all funds needing to be spent down by 2027. The program will utilize a unique funding model of advanced payments rather than the typical reimbursement model. Disbursements to recipients will be over a period of no more than three years, and further stipulations will be outlined in the upcoming draft program guidelines.

According to SGC during recent listening sessions for the program guideline development process, under-resourced communities include the following:

1. Top 25% CalEnviroScreen

[73] University of San Diego. (2021). Get Involved: Climate Collaborative San Diego Region. https://www.sandiego.edu/soles/hub-nonprofit/initiatives/climate-collaborative/get-involved.php
[74] Capital Region Climate Readiness Collaborative. (2019). Steering Committee & Collaborative Members. https://climatereadiness.info/about-us/members/
[75] Ibid.
[76] Ibid.
[77] Ibid.
[78] California Strategic Growth Council. (2021). Regional Climate Collaboratives Program: Frequently Asked Questions.
[79] Ibid.

2. AB 1550 low-income communities
3. Communities with median household income less than 80% of statewide average

Additionally, part of the guideline's development process will include definition of eligible applicants. As of the most recent SGC webinar, eligible applicants could include but are not limited to:

- Community-based organizations
- Nonprofits and foundations
- Small businesses
- Local government agencies
- Joint powers authorities
- Tribal governments
- Other organizations with a history of providing community-based outreach and technical assistance

SGC will not be offering technical assistance in this initial funding phase, but instead will provide technical assistance in other phases of the program, particularly during implementation. Staff shared that the lack of technical assistance in this initial application phase will be mitigated by a streamlined and simplified application process.

STRUCTURE & FUNCTION

According to SGC, applications should identify all stakeholders that have agreed to form a collaborative stakeholder structure and identify one managing stakeholder that has the organizational capacity to complete projects and the financial capacity to receive and be accountable for grants. Though there are not yet definitions for what constitutes a "region," SGC will likely allow for various sizes and scales of collaboratives. Furthermore, staff envisions collaboratives working at a place-based level, connected to, and aligned with regional initiatives. In alignment with SB1072 language, the program will leverage existing regional collaboratives and efforts, including those through ARCCA.

Collaboratives can perform a variety of actions for their respective regions. SGC outlined the following activities as part of a recent Listening Session webinar:

- Conduct outreach and build awareness of competitive grant programs
- Convene stakeholders to discuss community needs regarding potential climate change mitigation and adaptation projects eligible for statewide competitive grant programs with specific allocations for under-resourced communities
- Develop community and project plans, including climate action plans demonstrating local needs and identifying multiple-benefit projects for implementation
- Support the development of partnerships between stakeholders and potential public and private funding sources
- Provide policy, program, and technical advice to stakeholders to develop and align multi benefit projects with potential funding sources
- Serve as an intermediary between community stakeholders and technical assistance programs within relevant agencies and coordinate scientific and technical support from outside experts
- Coordinate and implement assistance and training to stakeholders in grant application development, project management, implementation, and monitoring
- Assist in the development of local job training and anti-displacement programs and policies

SAN JOAQUIN COUNTY REGIONAL CLIMATE COLLABORATIVES OPPORTUNITY ASSESSMENT

Given the renewed interest in regional collaboratives with the Governor's budgetary allocations and the history of sustained collaboratives in California, SJCOG has several opportunities to engage in a collaborative model for climate action that can leverage existing best practices and new funding sources.

PATHWAY 1: SJCOG FORMS A NEW REGIONAL CLIMATE COLLABORATIVE

The existing climate collaboratives in California are managed by third parties hired and funded by collaborative budgets or hosted by a local university; one collaborative is organized by California tribes. However, SJCOG could become the first council of governments to lead a collaborative. Such a collaborative could be formed at the San Joaquin County level, or the scope could be expanded to capture a larger number of stakeholders currently not included in the ARCCA collaboratives. One such opportunity includes partnering with Fresno COG or other Central Valley stakeholders to create a Central Valley Climate Collaborative under ARCCA.

ARCCA has developed a regional adaptation collaborative toolkit to aid organizations in the collaborative development process.[80] Below is an overview of the toolkit:

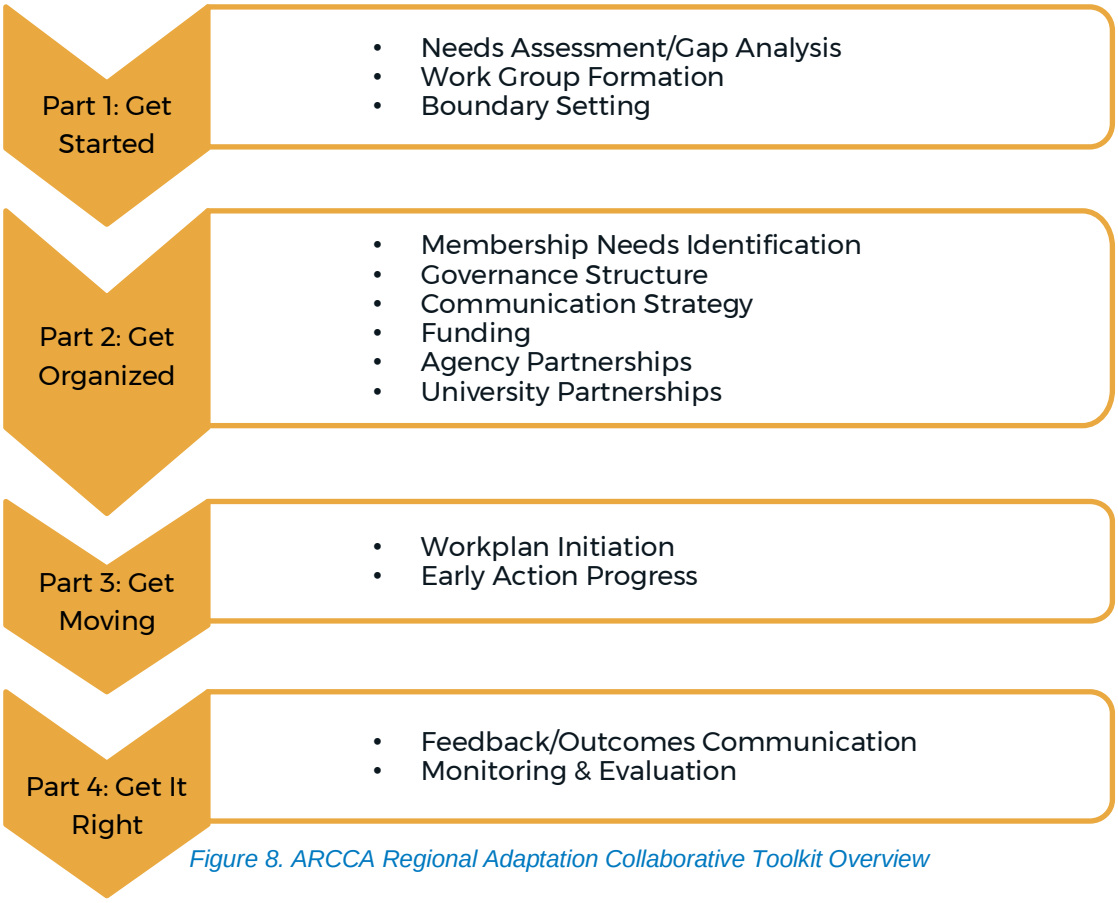

Figure 8. ARCCA Regional Adaptation Collaborative Toolkit Overview

[80] Alliance of Regional Collaboratives for Climate Adaptation. (2021). Regional Adaptation Collaborative Toolkit. https://arccacalifornia.org/toolkit/

The following sections apply the ARCCA model to SJCOG, highlighting one critical step within each part of the above toolkit.

Part 1: Get Started

As outlined in part 1, a work group inclusive of a diverse group of stakeholders is a critical component for a successful collaborative. The work group should be representative of those who can influence climate decisions and those who may be impacted.[81] Examples include:

- Municipal governments – especially staff from planning, public works, and environmental services
- Utilities – water, energy, waste, wastewater, etc.
- Public agencies – regional planning agencies, ports, airports, air quality management districts, health and human services, and offices of emergency services
- Universities – climate scientists, public policy centers
- Place-based philanthropic partners – community foundations, corporate foundations
- Nonprofits – technical assistance providers, community-based organizations
- Civic leaders – elected officials, business, or nonprofit leaders[82]

Though not included in ARCCA's list of recommended work group representatives, regional indigenous tribes should also be included, as they provide an important perspective and can help shape the policymaking decisions. Oftentimes, organizations can leverage existing relationships and invite in organizations who have conducted climate-related work in the region. If pursuing a county-level collaborative, SJCOG could leverage existing relationships., including the SJCOG member organizations as well as those organizations included in the Vulnerability Assessment Working Group (VAWG). If SJCOG wanted to pursue a larger Central Valley collaborative, the Department of Water Resources (DWR) has a fully staffed climate change program made up of staff in each DWR office throughout the State and has expressed interest in supporting further growth of climate collaboratives throughout the Central Valley region, particularly in those areas ARCCA does not currently serve. Whether either scale is pursued, community-based organizations with a focus on climate change, environmental justice, and/or equity should be invited to participate in the formation of a collaborative. A full list of recommended stakeholders for a County-level collaborative can be found in Appendix A.

Part 2: Get Organized

Part two of the ARCCA toolkit is focused on building the collaborative towards a common goal through the establishment of needs, governance, and communication preferences. Of critical importance is securing initial funding. Each of the existing collaboratives is uniquely funded. The CRC received an initial grant from the Sacramento Metropolitan Air Quality Management District and funds from the Pacific Gas and Electric Company and the Sacramento Municipal Utility District.[83]

Additionally, beginning in 2022, SGC will release program guidelines and funding deadlines for round one of the Regional Climate Collaboratives Program.[84] To be eligible, the community will likely need to be an under-resourced community, defined as being in the top 25% of CalEnviroScreen or an AB 1550 low-income community, both of which many of SJCOG's member jurisdictions fall

[81] Alliance of Regional Collaboratives for Climate Adaptation. (2021). 1. Identify overall need and gaps in existing resources through initial talks with key stakeholders. https://arccacalifornia.org/toolkit/element1/
[82] Ibid.
[83] Alliance of Regional Collaboratives for Climate Adaptation. (2021). 7. Secure initial funding. https://arccacalifornia.org/toolkit/element7/
[84] California Strategic Growth Council. (2021). Regional Climate Collaboratives Program: Frequently Asked Questions.

into[85,86]. SJCOG would qualify as an applicant as joint power authorities are listed as eligible. The amount of funding SGC plans to release per grant is unclear, but the program plans to disburse $20M over two or three grant cycles.

Though the SGC application and program guidelines have not been released, SGC indicated on a November 10th, 2021, webinar that each collaborative should select a managing stakeholder that can demonstrate the organizational capacity to complete projects and the financial capacity to receive and be accountable for the grant. If SJCOG wants to lead the collaborative, staff should apply as a managing stakeholder. The application should also include the stakeholder structure and only one application should be submitted per regional collaborative. The Managing stakeholder can ensure that all organizations present in the stakeholder structure participate in the application development process.

Part 3: Get Moving

Once a collaborative has membership established and funding secured, a major task is to develop an initial workplan that provides a roadmap for concrete future actions. Given SJCOG's size and position in the region, a large-scale, long-term, and evolving framework is most appropriate. For example, the Los Angeles Regional Collaborative for Climate Action and Sustainability (LARC) developed a workplan funded by SGC that included the following:

- A guidebook to climate science for local government practitioners, with particular emphasis on how climate change will impact Los Angeles.
- A summary of the Federal, State and Local policy mandates that clearly outlines what local actors are required to do, and what they are not required to do.
- An analysis of current greenhouse gas emissions - where they come from, who's producing how much and a list of priority actions to reduce emissions based on level of impact, cost effectiveness and local benefit.
- Identification of regionally specific priorities to maximize resilience, assessment of target actions to achieve these priorities and description and analysis of the best strategies for implementing these actions.[87]

[85] California Office of Environmental Health Hazard Assessment. (2021). SB 535 Disadvantaged Communities. https://oehha.ca.gov/calenviroscreen/sb535
[86] California Air Resources Board. (n.d.). California Climate Investments Priority Populations 3.0 by Census Tract. Retrieved December 5, 2021, from https://webmaps.arb.ca.gov/PriorityPopulations/
[87] Los Angeles Regional Collaborative for Climate Action and Sustainability. (2016). A Greater LA: Climate Action Framework. https://www.laregionalcollaborative.com/framework

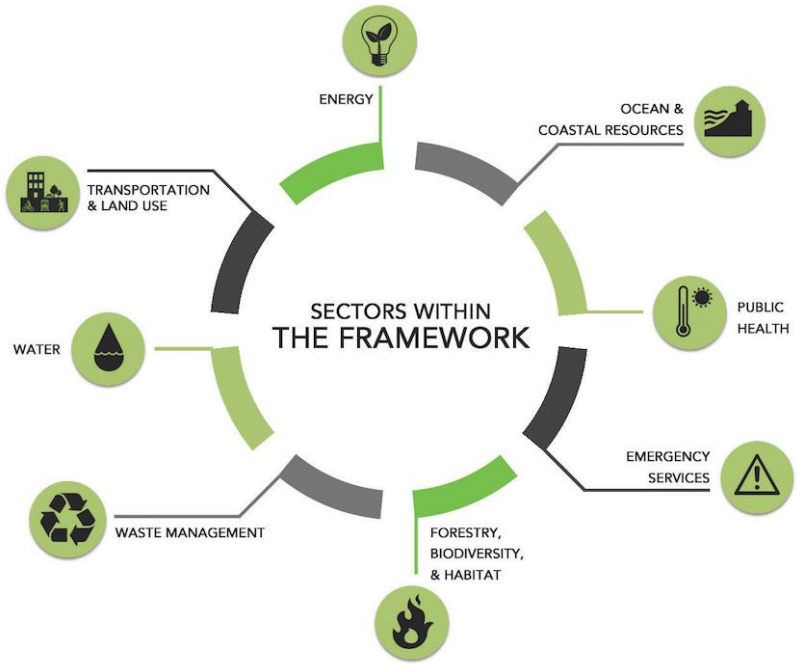

Figure 9. Overview of LARC's "A Greater LA Climate Action Framework"

The workplan includes a final report as well as a website designed to support local practitioners and regional leaders in identifying a suite of measures to create a more climate-resilient region. The workplan is organized around discrete sections covering transportation and land use, water, energy, public health, and ocean and coastal resources.[88]

SJCOG could lead the development of a San Joaquin County-wide workplan focused on the needs of local partners and communities and leveraging identified risks and recommendations from the Climate Adaptation and Resiliency Study. This could also be an opportunity to engage and partner in new issues for the COG, including water issues. Work done by other COGs in California could be consulted for best practices in new topic areas.

Part 4: Get it Right

The final step in the ARRCA toolkit includes setting up processes and mechanisms to track and report out on collaborative outcomes. ARCCA highly recommends reporting out on activities to members of the collaborative as it continues to engage members outside of meetings and reinforces the value of staff time and organizational investment by conveying progress and sharing resources.[89] To achieve this, many of the collaboratives have set up reoccurring newsletters such as the one shown in the below figure that go out to members with information about upcoming meetings, announcements from member organizations, funding notices, and links to recent relevant publications.

[88] Los Angeles Regional Collaborative for Climate Action and Sustainability. (2016). A Greater LA: Climate Action Framework. https://www.laregionalcollaborative.com/framework

[89] Alliance of Regional Collaboratives for Climate Adaptation. (2021). 12. Create process feedback mechanisms to communicate outcomes to stakeholders. https://arccacalifornia.org/toolkit/element12/

Figure 10. Newsletter Example from the Los Angeles Regional Collaborative for Climate Action and Sustainability (LARC)

Another way many collaboratives report out is through regular meetings, typically quarterly. The CRC holds quarterly meetings with presentations and discussion topics relevant to the region and often from regional partners, while the San Diego RCC holds Public Agency Network meetings for staff from all 18 of the region's public agencies.[90]

Regular communications are just one part of maintaining membership. When outlining membership dues, it's important to convey what members and participating jurisdictions can expect to receive in exchange for their financial contributions and time commitments. Most of the collaboratives have an overview or marketing brochure outlining membership benefits. Appendix B includes the CRC member benefits brochure from 2018.

Operational Considerations

If SJCOG were to take on the role of managing organization, staff should anticipate developing and maintaining an annual operating budget. Determining the budget targets is highly dependent on the work plan developed as part of ARCCA's Toolkit as well as staff rates. According to LGC, a newly forming collaborative could anticipate a starting budget of $30-50k; the CRC annual budget is typically around $75k based on membership dues and project-specific funding via grants. According to LARC'S Executive Director Erin Coutts, the LARC operating budget fluctuates between $25k and $40k, though a target budget would be closer to $75k. Director Coutts also provided background research she's conducted regarding national collaboratives, which identified annual budgets ranging from $10k up to $2.5M. The collaborative that had a $2.5M budget was largely a pass-through vehicle to project contracts and only lasted 2 years.

When developing a budget, organizations are mindful of balancing member dues and external funding sources like grants. Though membership dues are often a primary source of funding for collaboratives, some are hesitant to impose dues and fees as they may

[90] Alliance of Regional Collaboratives for Climate Adaptation. (2021). 12. Create process feedback mechanisms to communicate outcomes to stakeholders. https://arccacalifornia.org/toolkit/element12/

exclude certain organizations with limited financial means.[91] However, relying solely on external grants may be risky as those funding sources typically have a limited timeframe and are not guaranteed annually.

Administration of a collaborative typically requires several staff to manage the operations. Some collaboratives have dedicated staff while others utilize donated staff time from participating members.[92] According to Executive Director Coutts, her weekly commitment at LARC is typically around 20 hours a week with support from a student intern who works up to 10 hours a week, though she recommends budgeting for at least one full-time staff person. Below is a summary of the ARCCA collaboratives staffing models.

Table 9: Staffing for California RCCs

Collaborative	# of Staff	# of Steering Committee Members	# of Executive/Leadership Members
Capital Region Climate Readiness Collaborative	3	12	3
Bay Area Climate Adaptation Network	2	6	4
Los Angeles Regional Collaborative for Climate Action and Sustainability	3	N/A	10
North Coast Resource Partnership	N/A	13*	23
San Diego Regional Climate Collaborative	2	N/A	12
Sierra Climate Adaptation & Mitigation Partnership	2	5-9	N/A

*The North Coast Resource Partnership does not have a steering committee but rather a Technical Peer Review Committee.

PATHWAY 2: SJCOG SUPPORT LOCAL ORGANIZATION FORMATION OF A COLLABORATIVE

Though joint powers authorities are listed as eligible entities to apply for the 2022 SGC grants, SJCOG may not have the capacity to lead the formation of a collaborative. Additionally, oftentimes, collaboratives will opt to utilize a non-governmental neutral party to administer the collaborative to avoid any perception of jurisdictional influence or control. In this case, the above process can still be utilized by whichever organization decides to lead the effort. SJCOG may shift to an advocacy and support role, in which staff convene the initial discussions to identify participating stakeholders and a lead applicant. It may be advantageous for SJCOG to be involved as the managing stakeholder as a regional multi-jurisdictional agency that may have the capacity and systems in place to disburse funds more easily to local municipalities. Though a university may seem like an attractive institutional type to act in this capacity, one challenge for collaboratives with a university as the managing stakeholder is due to the overhead costs associated with university administration of grants.[93]

[91] Bennett, A., & Grannis, J. (2017). Lessons in Regional Resilience: Case Studies on Regional Climate Collaboratives. https://www.georgetownclimate.org/files/report/GCC-Lessons-in-Regional-Resilience-Synthesis-Jan_2017.pdf
[92] Alliance of Regional Collaboratives for Climate Adaptation. (2021). 12. Create process feedback mechanisms to communicate outcomes to stakeholders. https://arccacalifornia.org/toolkit/element12/
[93] Ibid.

If SJCOG would like to guide the selection process for a lead organization, SGC staff has indicated work should be conducted at a place-based scale to support local communities in accessing funding for project planning and implementation.[94] SGC has also placed importance on collaboratives which center on racial and social equity.[95] Therefore, an applicant should be tied to the SJCOG region at some scale and would ideally have a mission statement focused on racial and/or social equity, such as one of the community-based organizations or non-profit organizations listed in Appendix A. For example, the Inland Southern California Climate Collaborative (ISC3) includes members such as the Western Riverside Council of Governments, but Climate Resolve, a local non-profit, serves as the collaborative's facilitator and fiscal agent[96],[97].

One organization that SJCOG may want to approach about applying for the 2022 SGC grants is Rise Stockton, a coalition of environmental justice-focused organizations brought together by the City of Stockton in 2017 through a Transformative Climate Communities (TCC) Planning Grant funded by SGC.[98] The coalition was awarded a TCC Implementation Grant in 2020, and thus has a proven track record of successful organizing and collaboration towards a common climate resilience goal. Additionally, the organization's vision, mission, and goals are in alignment with the overall intent of the RCC program; the vision statement is to, "[embrace] a future for Stockton that creates a sustainable, equitable, livable city in collaboration with community members, local government, and regional business leaders."[99]

If SJCOG decides to be a supporting and/or managing organization for the collaborative, the agency should identify staff to participate in regular meetings and staff to manage the grant acceptance, disbursement, tracking, reporting, and closeout.

PATHWAY 3: SJCOG JOINS AN EXISTING REGIONAL CLIMATE COLLABORATIVE

San Joaquin County is adjacent to three existing collaboratives, including the CRC, the Bay Area Climate Adaptation Network (BayCAN), and the Sierra Climate Adaptation and Mitigation Partnership (Sierra CAMP), as shown in the below figure.

Figure 11. RCCs Adjacent to San Joaquin County

[94] Alliance of Regional Collaboratives for Climate Adaptation. (2021). 12. Create process feedback mechanisms to communicate outcomes to stakeholders. https://arccacalifornia.org/toolkit/element12/
[95] California Strategic Growth Council. (2021). Regional Climate Collaboratives Program: Frequently Asked Questions.
[96] Ibid.
[97] Inland Southern California Climate Collaborative. (2020). Members. http://iscclimatecollaborative.org/members/
[98] Rise Stockton. (n.d.). Rise Stockton Coalition: Our Purpose. Retrieved January 9, 2022, from https://risestockton.org/our-purpose
[99] Inland Southern California Climate Collaborative. (2020). Become a Member. http://iscclimatecollaborative.org/#joinisc3

BayCAN includes the nine-county San Francisco Bay Area, while the CRC covers the six-county SACOG region including the counties of El Dorado, Placer, Sacramento, Sutter, Yolo, and Yuba; the Sierra Climate Adaptation & Mitigation Partnership spans from Sequoia and Kings Canyon National Parks in the south all the way north to the Oregon border and southern section of the Cascade Mountain range, and from the Sierra foothills to the Nevada border.[100] Though each of the collaboratives is geographically bound, there is some overlap between several of the collaboratives, indicating the possibility for expansion.

It's recommended that SJCOG convene a workshop with the three adjacent collaboratives to determine a path forward regarding potential membership in any one or more of the collaboratives. The contact information for the three collaboratives is in the below table.

Table 10: Adjacent Collaboratives Points of Contact

Name	Climate Collaborative	Email
Julia Kim	Capital Regional Climate Readiness Collaborative	jkim@lgc.org
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Yeshe Salz	Bay Area Climate Adaptation Network	yeshe@baycanadapt.org
N/A	Sierra Climate Adaptation and Mitigation Partnership	sierracamp@sierrabusiness.org
James Sedlak	Sierra Climate Adaptation and Mitigation Partnership	jsedlak@sierrabusiness.org
Meredith Anderson	Sierra Climate Adaptation and Mitigation Partnership	manderson@sierrabusiness.org

PATHWAY 4: CONTINUE INFORMAL COLLABORATION / NOT FORM OR JOIN AN RCC

Given SJCOG has existing committees, staff could opt to not form a collaborative but instead leverage existing interagency work groups, such as the VAWG, which was a venue for regular updates during the project. The VAWG includes several organizations who were identified as key stakeholders for a collaborative formation. Other organizations not part of the VAWG could be invited to attend meetings where Resilience Program updates are on the agenda.

Alternatively, staff can utilize existing public facing committees such as the Technical Advisory Committee (TAC) to ensure any information shared out is publicly available. Doing so would also afford staff a larger audience and include external partners that may

[100] Alliance of Regional Collaboratives for Climate Adaptation. (2021). Regional Collaboratives. https://arccacalifornia.org/about/collaboratives/

have a vested interest in a resilience program. Staff has previously provided project updates at previous TAC meetings and could discuss creating a regular agenda item for the topic with TAC administrators.[101]

CONCLUSION

As the State ramps up several programs and prepares to disburse billions of dollars to climate change programs and grants, SJCOG is well-positioned to continue and expand its climate adaptation and resiliency program. One significant contribution SJCOG could bring to the region is the formation of an RCC, which have grown in popularity over the last few years and will be significantly funded beginning in 2022. SJCOG staff should leverage the excellent multi-agency collaboration conducted as part of the Climate Adaptation and Resiliency Study and engage those stakeholders in the formation of a regional collaborative, while preparing to apply for the SGC funding, either as a lead or supporting entity. Doing so will ensure the continued success and cross-jurisdictional work to combat climate change.

[101] San Joaquin Council of Governments, (n.d.), Technical Advisory Committee, Retrieved December 2, 2021, from https://www.sjcog.org/156/Technical-Advisory-Committee

STAKEHOLDER LIST

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Kim Anderson		kanderson@rgs.ca.gov	

* Coalition of organizations including Asian-Pacific Self-Development and Residential Association, Catholic Charities Diocese of Stockton, The Climate Center, Changeist, The Edible Schoolyard Project, Elemental Excelerator, The Greenlining Institute, GRID Alternatives, Little Manila Rising, Public Health Advocates, PUENTES, Restore the Delta, Rising Sun Center for Opportunity, STAND, and Third City Coalition.

CAPITAL REGION CLIMATE COLLABORATIVE MEMBER BENEFITS OVERVIEW

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CRC Member Benefits

Updated June 2018

Members of the Capital Region Climate Readiness Collaborative (CRC) receive a multitude of benefits in support of their own agency or organization's initiatives, as well as to accelerate climate change mitigation and adaptation efforts throughout our region.

In an effort to make these benefits more accessible, CRC staff are working to create standardized processes and systems that leverage online platforms. In the meantime, please reach out to Grace Kaufman at gkaufman@lgc.org for any of the following services that CRC can provide to its members.

Access to a network of climate leaders in the Capital Region

Annual Members Forum

Each year, CRC conducts a members-only forum to facilitate valuable connections between members, identify new initiatives that can be pursued collaboratively, and to highlight local and regional efforts.

Annual Check-In with Steering Committee

Starting in 2018, CRC members will have the opportunity to directly connect with a steering committee representative to share about their needs, priorities, and projects for inclusion in CRC marketing efforts and to inform CRC's annual priorities.

Staff Support for Introductions, Resources, and Marketing

As requested, CRC provides introductions to connect its members to leaders and practitioners across a range of different disciplines and sectors within our broader network. CRC staff also provide additional support to locate specific resources, assist with marketing and promotion efforts, and more!

CRC Directory and Participant Lists

All members have access to a directory of CRC members, as well as participant lists from CRC's meetings.

Targeted resources and support for individual efforts

Promotion

Members have the opportunity to highlight their work through webinars hosted by CRC and ARCCA, which regularly welcome 100-200 participants.

Event Support

As requested, CRC provides support to its members to help identify high-level speakers for events, as well as to include member events in CRC's calendar, newsletter, and targeted promotion emails.

Co-Branded Marketing Materials

All members have the opportunity to co-brand marketing materials developed by CRC including the Investing In Our Future and the OutsideIn factsheet series.

Expert Review of Draft Documents

By leveraging trusted relationships with key regional and State partners, CRC can help its members gather valuable input and feedback from subject-matter experts, on-the-ground practitioners, and community-based organizations for policies, plans, and resources under development.

Assistance for grant writing and development

Support Letters

CRC provides support letters for members who are applying for grants. With a diverse and expansive membership, support letters from CRC showcase strong regional and cross-sector support.

Project Ideation and Design

As new funding opportunities become available, CRC provides coordination support and guidance to members to help identify project concepts and support grant writing efforts.

Joint Fundraising Proposals

A growing priority for CRC is to facilitate joint efforts to pursue funding as exemplified in the successful SB-1 Transportation Adaptation Planning Grant and Transformative Climate Communities Planning Grant applications for regional projects.

Stay up-to-date on the latest climate news and opportunities

Quarterly Adaptation Exchange

Each quarter, CRC hosts a workshop on timely and relevant topics that bring together the region's leaders and experts for informative presentations and interactive discussions.

Biweekly Regional Newsletter

CRC members receive biweekly CRC newsletters, which include regionally-relevant news, grant opportunities, events, case studies, and resources.

Biweekly Statewide Newsletter

CRC members also receive biweekly ARCCA newsletters, which highlight key news, opportunities, and resources related to adaptation in California more broadly.

Funding Alerts

CRC sends announcements for new grant programs and funding opportunities to its members.

Demonstrate your leadership in and commitment to climate action

Opportunity to Join CRC Steering Committee

Each year, members are given the opportunity to join CRC's Steering Committee for a two-year commitment. By joining the Steering Committee, members can directly shape CRC priorities and activities.

Recognition as a Leader

As a member of CRC, your organization is recognized as a regional leader in climate adaptation and mitigation through our website, webinars, workshops, and newsletters.

State Policy Engagement

Members have the opportunity to engage with California's adaptation thought leaders to advance State policies by engaging in the development of robust comment letters through ARCCA.

APPENDIX D – TEMPLATE LANGUAGE FOR GENERAL PLAN SAFETY ELEMENTS

BACKGROUND AND INSTRUCTIONS

The template language provided on the following pages is for San Joaquin Council of Governments (SJCOG) member jurisdictions to use to support compliance with Senate Bill (SB 379) and Government Code Section 65302(g). Under current State law, every city and county must adopt a general plan. SB 379 (Jackson), passed in 2015, requires cities and counties to include climate adaptation and resilience strategies in the safety elements of their general plans *on or before* January 1, 2022, if they do not have a local hazard mitigation plan (LHMP), and update the element no less than every eight years after inclusion. OPR conducted a survey in 2020 to understand how local governments were meeting these requirements. Of the 57 survey respondents, only 23% had added the required elements. Because of the vague wording of the statute, some have concluded that the January 1st date was an effective deadline, whereas others have interpreted the date to initiate a series of triggers in which the safety element must be reviewed and updated. The California Office of Planning and Research (OPR) recommends that local jurisdictions seek legal advice from their city attorney or county counsel to understand compliance obligations.

Per SB 379 and Government Code Section 65302(g), the review and update of the safety element must include the following:

- **A vulnerability assessment** that identifies the threat that climate change poses to the local jurisdiction.
- A set of **adaptation and resilience goals, policies, and objectives** that is based upon the vulnerability assessment findings.
- A set of **implementation measures** which are designed to achieve adaptation and resilience goals, policies, and objectives.

To assist local jurisdictions, several regional organizations such as the Southern California Association of Governments (SCAG) and Fresno COG have developed SB 379 compliance guidance. Similarly, SJCOG developed this template language for its member jurisdictions to incorporate into their general plan safety elements and is based on SJCOG's efforts to understand and respond to regional risks posed by climate change through its Climate Adaptation and Resiliency Study completed in 2020 and its Regional Resiliency Implementation Plan and Adaptation Guidance project, which is underway.[102] However, as a Metropolitan Planning Organization (MPO), SJCOG's climate change assessment and response efforts are focused on transportation and local jurisdictions will need to take that into account when applying template language to their general plan.

The template language below is intended to be a starting point for member jurisdictions, who can add to and edit this language to make it more relevant and localized to their jurisdiction. For example, where SJCOG's Climate Adaptation and Resiliency study and report is summarized, the jurisdiction may choose to add local projections from Cal-Adapt. Member jurisdictions should also carefully consider if proposed adaptation goals, policies, and objectives align with their agency and community, and if implementation strategies are realistic and feasible. These lists are provided to be augmented or edited by local jurisdictions. Other resources that are useful for adaptation planning are the California Office of Emergency Services 2020 California Adaptation Planning Guide and the Adaptation Clearinghouse. San Joaquin County has adopted a LHMP that meets the requirements of the Disaster Mitigation Act of 2000 and includes a county climate change vulnerability assessment per SB 379. This LHMP can also be referenced in jurisdiction general plan safety elements, especially for including assets and hazard impacts which are not transportation specific. Highlighted text provides directions where jurisdictions may wish to add or edit information.

This language is not intended to replace existing safety element language or act as a standalone safety element for any one jurisdiction. The safety element must still identify "unreasonable risks and policies for the protection of the community from such risks" (Gov't Code 65302(g)(1)) and other legislative requirements, follow the OPR General plan Guidelines, and be internally consistent with other general plan elements.[103]

Many jurisdictions are likely still working on their safety plan updates to comply with SB 379 and Government Code Section 65302(g). However, local agencies should be mindful of these requirements and respond to the time frames provided as there may be

[102] Referring to existing plans is acceptable for compliance with SB 379.
[103] Jackson, Senate Bill 379, October 08, 2015, https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201520160SB379

the potential for litigation if a jurisdiction is out of compliance. For member jurisdictions who are concerned that their safety element will not be updated in the near-term or may need an extension on their general plan, OPR is able to review and approve general plan extensions through the process outlined here. For member jurisdictions that need additional funding to complete the safety element updates, CalFire Fire Prevention Grants Program awards can be used to cover safety element revisions.

SAFETY ELEMENT - TEMPLATE LANGUAGE

VULNERABILITY ASSESSMENT

In 2020, the San Joaquin Council of Governments (SJCOG) conducted a Climate Adaptation and Resiliency Study (or "Phase I Study") to identify critical transportation infrastructure assets within San Joaquin County, including jurisdiction _____, and assess their existing and future vulnerability to climate change impacts. Existing climate change planning efforts were incorporated to provide a more holistic understanding of risks in the area and to allow for prioritization of assets for resilience efforts. The goals of this project were to sustain multi-modal transportation, create and maintain network redundancy, and improve overall resiliency and reliability of San Joaquin County's transportation system. These goals and the approach to the vulnerability assessment were developed alongside a working group of regional stakeholders, including jurisdiction _____ [add your local jurisdiction if you attended one or more of the SJCOG workshops].

ASSESSMENT APPROACH

The approach to the Climate Adaptation and Resiliency study followed the steps below:

1. The study team collaborated to develop key resiliency goals that focused on improvements to the transportation system. Identification of goals helped to focus the study's scope and prioritize project outcomes and deliverables.
2. The study team conducted a vulnerability assessment that utilized greenhouse gas emission projections (RCP 4.5 and RCP 8.5), climate data, and information on relevant transportation assets. The data was used to determine future climate impacts on selected transportation assets and flag high vulnerability assets.
3. The study team used a planning horizon to the year 2050 to synchronize the timeline with RTP and other local efforts.
4. The study team then assessed the vulnerability of assets in relation to identified climate vulnerabilities. Key assets included bus routes, transportation support/maintenance services, goods movement connectors, access points for transportation-disadvantaged populations, evacuation routes, and air and deep-water transport.
5. A criticality assessment was conducted to focus on transportation most important to proper transportation network functioning.
6. A vulnerability assessment was conducted to determine which assets will be most vulnerable (defined to include exposure, sensitivity, adaptive capacity, and consequence) to climate change impacts and to quantify potential disruption. Findings were compared to project resilience goals to prioritize assets according to vulnerability.

CLIMATE PROJECTIONS

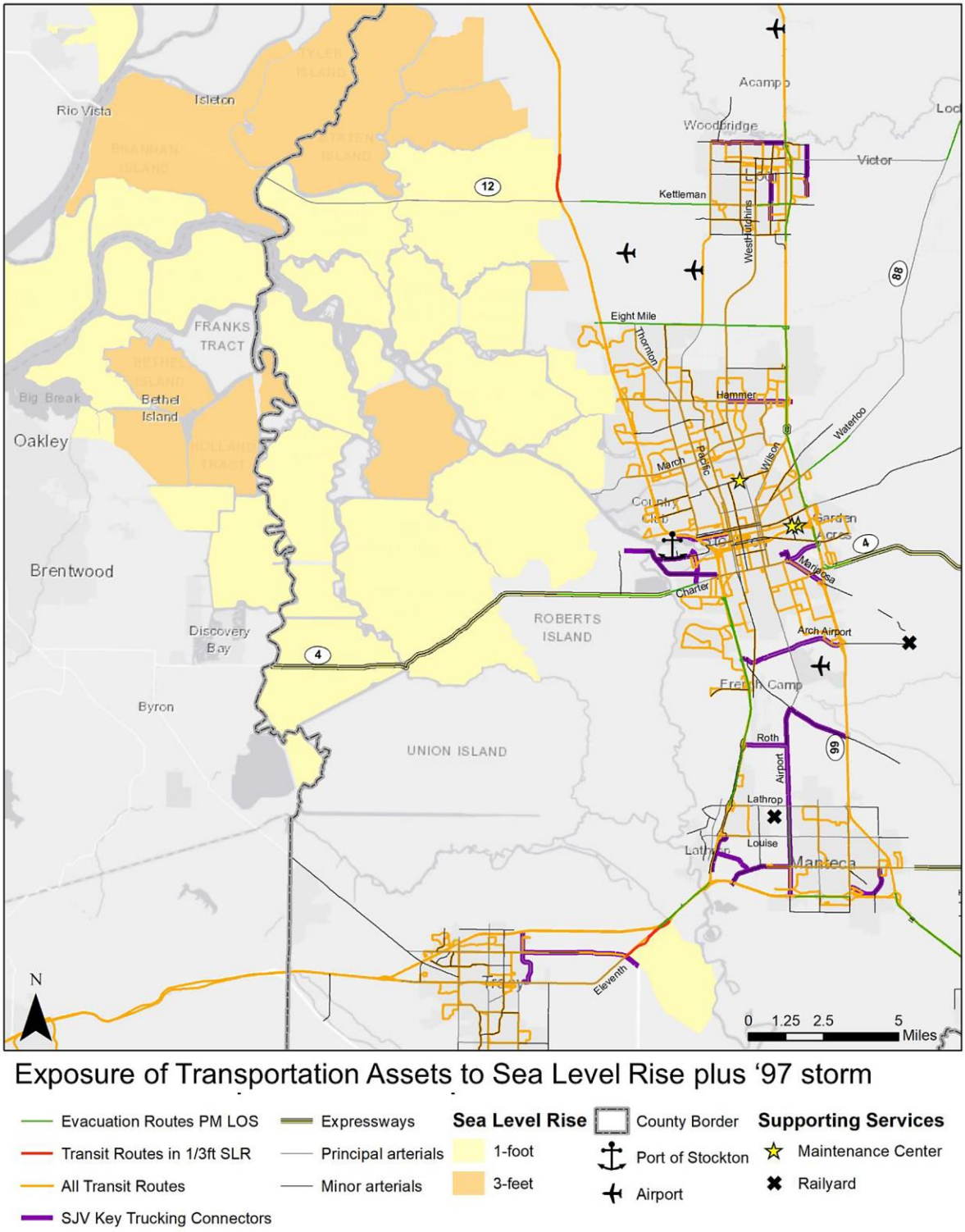
Key climate hazards assessed in the vulnerability assessment included increases in sea level rise, fluvial/riverine inflows, extreme precipitation events, wildfire, and extreme heat.

Overall, San Joaquin County is predicted to experience more flooding due to sea level rise and riverine flooding. This can significantly impact bridge infrastructure by reducing clearing (or "freeboard") and undermining bridge structures. Flooding can also overwhelm drainage systems, damaging rails, roads, and airport infrastructure. Additional improvements need to be made to San Joaquin County levees to protect against sudden flood events. As a key example, Stockton Airport is located within the 100-year floodplain and may

experience significant flight delays and cancellations from flood events. See Figure 12 for sea level rise projections in the Sacramento-San Joaquin River Delta, on top of a modeled 1997 flood event.[104]

San Joaquin County is also projected to experience increased frequency and intensity of precipitation events. This can contribute to flooding and flash flooding which can overwhelm drainage systems and exacerbate the effects of sea level rise and riverine flooding. See Figure 13 for San Joaquin County evacuation routes that lie in existing flood zones.

[104] The 1997 led to failure of many levees. The state declared a state of disaster in 43 counties. This flood was approximately equivalent to a 100-year flood.



Exposure of Transportation Assets to Sea Level Rise plus '97 storm

- Evacuation Routes PM LOS
- Transit Routes in 1/3ft SLR
- All Transit Routes
- SJV Key Trucking Connectors
- Expressways
- Principal arterials
- Minor arterials

Sea Level Rise

- 1-foot
- 3-feet

- County Border
- Port of Stockton
- Airport

Supporting Services

- Maintenance Center
- Railyard

Figure 12: Transportation asset exposure to sea level rise and the modeled 1997 storm event

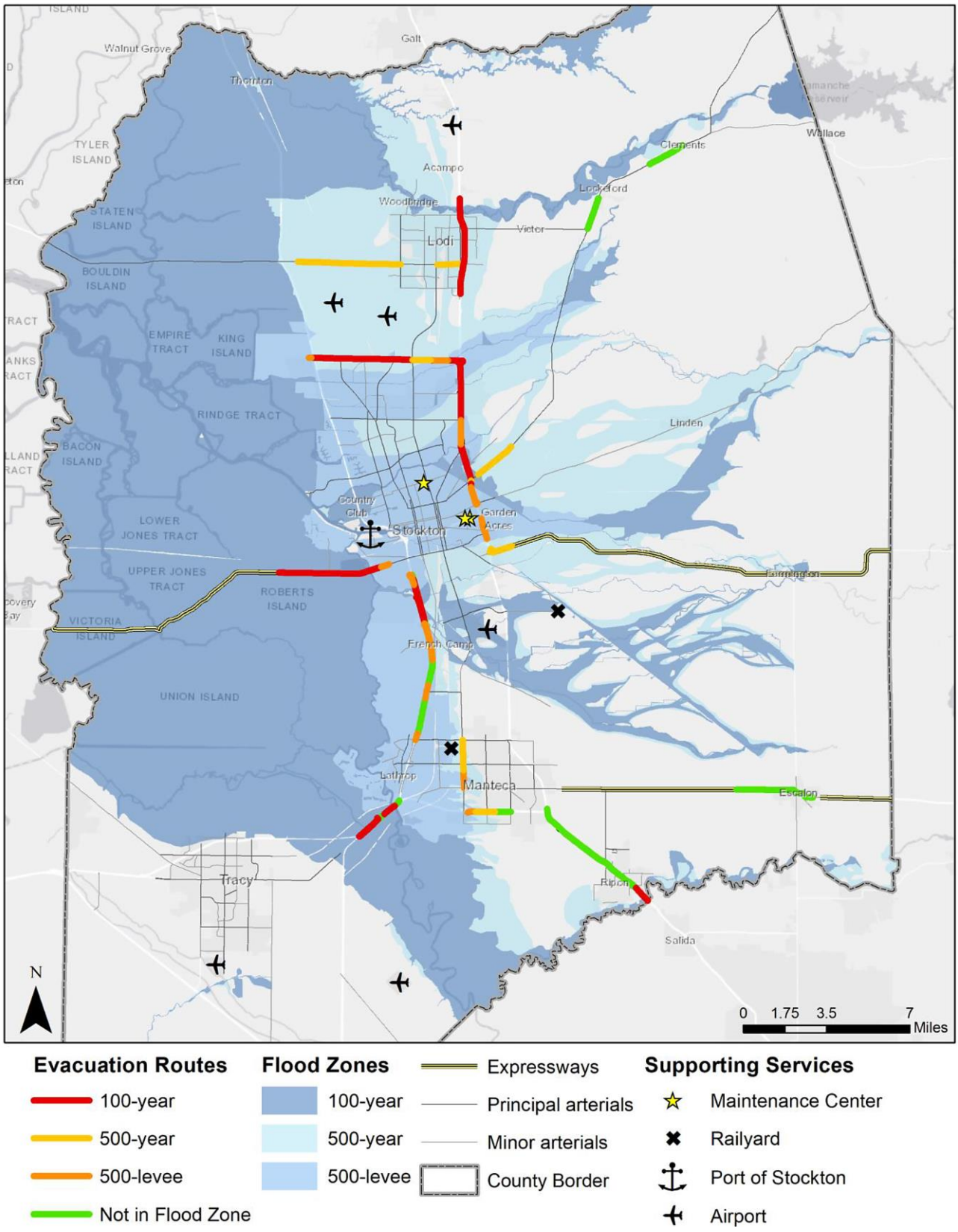


Figure 13: San Joaquin County evacuation routes in existing flood zones

Wildfires are projected to remain consistent or even slightly decrease in frequency across San Joaquin County. However, wildfires may still impact transportation infrastructure by causing closures that may exacerbate congestion and restrict access to transportation from other climate impacts.

San Joaquin County is projected to experience a significant increase in the number of hot days which can place strain on rail infrastructure, roads, runways, and maintenance activities by straining the health of maintenance workers.

Lastly, drought and the potential of a mega-drought are predicted to increase in California. Drought can cause roadway pavements to crack and can increase the likelihood of wildfires.

[Member jurisdictions can add to these climate projections by referencing more localized projections from another vulnerability assessment or Cal-Adapt, particularly the Local Climate Change Snapshot Tool, which may be the most accessible option for under-resourced jurisdictions with limited climate modeling capabilities].

SAN JOAQUIN REGION VULNERABILITIES

Results of the study show the widespread impact of selected climate stressors that make it difficult to identify top priority assets in some cases. The most critical assets in the San Joaquin region were identified through the criticality assessments based on multimodal transportation, redundant routes, and emergency response. In the vulnerability assessment, the project team then evaluated how these assets are projected to be affected by each climate stressor of concern in the San Joaquin region. The top priority assets for adaptation responses are summarized in Table 1 below [member jurisdictions can choose to just highlight the assets within their jurisdiction, or supplement with non-transportation assets identified in other source materials like San Joaquin County's Local Hazard Mitigation Plan].

Table 11: Top Priority, Vulnerable Assets in the San Joaquin Region

Top Priorities	Additional Priorities
SR 99 through Lodi	Port of Stockton
South Stockton Neighborhood	I-5 between Tracy and Lathrop
Stockton Airport	Waterloo Road/CA 88
Stockton Wye	Bus stops in downtown Stockton, Hammer Triangle, and Harrell Park
SR 4 from Stockton west to Contra Costa	
BNSF Intermodal Railyard	

RESILIENCE GOALS AND OBJECTIVES

SJCOG's Phase I study was followed by the Regional Resiliency Implementation Plan and Adaptation Guidance project (or the "Phase II Study"), which responds to the vulnerabilities identified by developing adaptation responses. Both the SJCOG Climate Adaptation and Resiliency study and the Regional Resiliency Implementation Plan and Adaptation Guidance project developed key resiliency goals and objectives for the San Joaquin region that focused on improvements to the transportation system. These goals and objectives were developed through public and stakeholder engagement and were used to create and organize implementation strategies to achieve them. [These goals and objectives were organized from their original formats for inclusion into a general plan safety element. Jurisdictions are encouraged to review the list and edit/add as is suitable to their community and their own goals. This list is based off stakeholder and community feedback collected for SJCOG's climate change projects but is not all-inclusive].

Goal 1: Create and maintain a resilient transportation network to deliver people, goods, and emergency services, with a focus on underserved populations.

- Objective 1.1: Create and maintain redundancy in the transportation system to allow for rerouting during disruptions and ensure operation of routes supporting evacuation.
- Objective 1.2: Address climate impacts to the transit system.
- Objective 1.3: Integrate climate resilience into all road improvement projects.
- Objective 1.4: Integrate transportation resilience into the Regional Transportation Plan (RTP).
- Objective 1.5: Update design guidance and criteria for transportation infrastructure projects to increase resiliency and account for climate projections.
- Objective 1.6: Prioritize vulnerable and critical locations for adaptation projects.
- Objective 1.7: Expand opportunities for Electric Vehicle (EV) and zero/low emission vehicle use.

Goal 2: Increase energy reliability and prepare for power outages.

- Objective 2.1: Plan for Public Safety Power Shut Offs (PSPSs) as they become more frequent due to wildfire risk.
- Objective 2.2: Increase backup power options.

Goal 3: Build community resilience, support community-led adaptation, and reduce public health and safety risks from climate hazards.

- Objective 3.1: Prioritize the adaptation and funding needs of underserved and underrepresented communities.
- Objective 3.2: Increase public education and outreach on climate change.
- Objective 3.3: Create climate or "green" job opportunities.
- Objective 3.4: Reduce Urban Heat Island and increase tree canopy.
- Objective 3.5: Provide community resources to mitigate the impacts of hazard events.
- Objective 3.6: Continue levee improvements.

Goal 4: Strengthen and build collaboration and partnerships around climate impacts.

- Objective 4.1: Expand SJCOG's role as a source of technical assistance and up-to-date information, guidance, and leadership for county-wide integration of resilience for member agencies, stakeholders, and the public.
- Objective 4.2: Improve coordination across stakeholders and local governments.
- Objective 4.3: Develop template or sample language for documents.

Goal 5: Identify and create additional adaptation funding and staff resource opportunities.

- Objective 5.1: Increase and identify funding opportunities for vulnerability assessments and adaptation.
- Objective 5.2: Partner with organizations like the Climate Action Corps to organize and implement climate change projects.

IMPLEMENTATION STRATEGIES

The SJCOG Climate Adaptation and Resiliency Study identified planning gaps and a set of recommendations to increase the resiliency of the transportation system in the San Joaquin region. The Regional Resiliency Implementation Plan and Adaptation Guidance furthers the strategies of SJCOG's first study by providing specific solutions for the transportation asset vulnerabilities identified. These "implementation strategies" were collected from community engagement with San Joaquin stakeholders and the public and

were prioritized based upon factors such as effectiveness, cost, and ease of implementation. These implementation strategies are listed here based upon the resiliency goals and objectives they most closely align with. [These strategies were organized from their original formats for inclusion into a general plan safety element and can be incorporated into a general plan implementation matrix. Jurisdictions are encouraged to review the list and edit/add as is suitable to their community and their own goals. This list is based off stakeholder and community feedback collected for SJCOG's climate change projects but is not all-inclusive. **Please note that some of the implementation strategies are specific to a certain geography or community**].

GOAL	OBJECTIVE	IMPLEMENTATION STRATEGY
Goal 1: Create and maintain a resilient transportation network to deliver people, goods, and emergency services, with a focus on underserved populations.	Objective 1.1: Create and maintain redundancy in the transportation system to allow for rerouting during disruptions and ensure operation of routes supporting evacuation.	Strategy 1.1.1: Implement rail improvements to existing infrastructure (e.g., electrification, grade separation). (SJCOG Phase II Study: Strategy #14).
		Strategy 1.1.2: Create more efficient and accessible rail service. Improve connections to rail options like Valley Link, Amtrak, and ACE. (SJCOG Phase II Study: Strategy #13).
		Strategy 1.1.3: Develop a Regional Emergency Response Plan which integrates the region's transit operators and their role in a mass evacuation event. (SJCOG Phase II Study: Strategy #55).
	Objective 1.2: Address climate impacts to the transit system.	Strategy 1.2.1: Expand bus routes and hours with increased frequency and reliability, particularly in underserved communities such as South Stockton. (SJCOG Phase II Study: Strategy #7).
		Strategy 1.2.2: Provide more comfortable, shaded transit stops, especially in underserved communities such as South Stockton. (SJCOG Phase II Study: Strategy #6).
		Strategy 1.2.3: Expand on-demand transit (paratransit). (SJCOG Phase II Study: Strategy #12).
	Objective 1.3: Integrate climate resilience into all road improvement projects.	Strategy 1.3.1: Understand increasing lifecycle pavement costs and evaluate new pavement technologies and designs. (SJCOG Phase II Study: Strategy #42).

		Strategy 1.3.2: Improve landscaping along highways, especially near disadvantaged communities, to provide shade, increase albedo and mitigate UHI, reduce noise from traffic, and improve views. Use of drought-tolerant and native landscaping is preferred to reduce water use. (SJCOG Phase II Study: Strategy #47).
	Objective 1.4: Integrate transportation resilience into the Regional Transportation Plan (RTP).	Strategy 1.4.1: Develop climate resilience metrics to evaluate 2022 RTP/SCS project list and overall prioritization. (SJCOG Phase II Study: Strategy #45).
		Strategy 1.4.2: Include climate resilience policy language in the 2022 RTP/SCS which can also be used as template language around climate change by local jurisdictions and partner agencies. (SJCOG Phase II Study: Strategy #2).
		Strategy 1.4.3: Create a project manager guidance/checklist for SCS/RTP project managers to consider climate risks in the planning and design phases of projects identified as vulnerable to one or more climate hazards. (SJCOG Phase II Study: Strategy #56).
	Objective 1.5: Update design guidance and criteria for transportation infrastructure projects to increase resiliency and account for climate projections.	Strategy 1.5.1: Update design criteria and guidance for infrastructure projects to address climate change. (SJCOG Phase II Study: Strategy #17).
		Strategy 1.5.2: Reconfigure bridge piers to reduce restriction of flow. Other bridge improvements to increase freeboard and reduce risk of scour. (SJCOG Phase II Study: Strategy #43).

	Objective 1.6: Prioritize vulnerable and critical locations for adaptation projects.	Strategy 1.6.1: Conduct a flood adaptation and evacuation planning assessment for SR-4 from Stockton west to Contra Costa County. (SJCOG Phase II Study: Strategy #53).
		Strategy 1.6.2: Conduct a flood adaptation and evacuation planning assessment for SR 99 through Lodi. (SJCOG Phase II Study: Strategy #50).
		Strategy 1.6.3: Implement flood mitigation techniques for City of Stockton public housing located in floodplains. (SJCOG Phase II Study: Strategy #40).
		Strategy 1.6.4: Conduct a South Stockton flood adaptation and evacuation assessment for roads, transit stops, and rail. (SJCOG Phase II Study: Strategy #51).
		Strategy 1.6.5: Stockton Wye flood adaptation assessment. (SJCOG Phase II Study: Strategy #52).
		Strategy 1.6.6: BNSF Intermodal Railyard (Stockton) flood adaptation assessment. (SJCOG Phase II Study: Strategy #54).
		Strategy 1.6.7: Corral Hallow adaptation assessment including consideration of mudslides, erosion, wildfire; evacuation challenges; bridge capacity issues. (SJCOG Phase II Study: Strategy #39).
		Strategy 1.6.8: Waterloo Road/CA-88 flood mitigation assessment and evacuation planning. (SJCOG Phase II Study: Strategy #49).
	Objective 1.7: Expand opportunities for EV and zero/low emission vehicle use.	Strategy 1.7.1: Provide additional EV charging stations across the region. (SJCOG Phase II Study: Strategy #15).

		Strategy 1.7.2: Start a low emissions car share program. (SJCOG Phase II Study: Strategy #9)
Goal 2: Increase energy reliability and prepare for power outages.	Objective 2.1: Plan for Public Safety Power Shut Offs (PSPSs) as they become more frequent due to wildfire risk.	Strategy 2.1.1: Install more comprehensive backup power at Port of Stockton for outages. (SJCOG Phase II Study: Strategy #48).
	Objective 2.2: Increase backup power options.	Strategy 2.2.1: Invest in smart grids, microgrids, solar, and/or community power to improve energy reliability. (SJCOG Phase II Study: Strategy #35)
		Strategy 2.2.2: Design and install back-up power to ensure that electric transit can still provide regular service or assist in evacuation when there are outages. (SJCOG Phase II Study: Strategy #37).
Goal 3: Build community resilience by supporting community-led adaptation and reducing public health and infrastructure risks from climate hazards.	Objective 3.1: Prioritize the adaptation and funding needs of underserved and underrepresented communities.	Strategy 3.1.1: Assess designated and "informal" trucking routes that may have disproportionate impacts to neighboring communities. (SJCOG Phase II Study: Strategy #8).
	Objective 3.2: Increase public education and outreach on climate change.	Strategy 3.2.1: Create a public education campaign to ensure that the public understands climate change projections, impacts, adaptation strategies, and the terminology surrounding these topics. The public education campaign should include information about evacuation prep, the act of evacuating, and returning home. (SJCOG Phase II Study: Strategy #32).
	Objective 3.3: Create climate or "green" job opportunities.	Strategy 3.3.2: Develop and provide "green" business job trainings. (SJCOG Phase II Study: Strategy #34).

	Objective 3.4: Reduce Urban Heat Island and increase tree canopy.	Strategy 3.4.1: Create a new program between regional nonprofits and stakeholders, who provide funding for free shade trees for homeowners/business owners to plant alongside roadways and sidewalks. (SJCOG Phase II Study: Strategy #4).
		Strategy 3.4.2: Plant more trees along roadways and sidewalks, particularly in urban areas such as Stockton and neighborhoods with limited investments in tree canopies such as South Stockton. (SJCOG Phase II Study: Strategy #3).
	Objective 3.5: Provide community resources to mitigate the impacts of hazard events.	Strategy 3.5.1: Provide free transit to cooling centers on extreme heat days. (SJCOG Phase II Study: Strategy #10).
		Strategy 3.5.2: Provide better communication services in emergencies. Communications should be offered in multiple languages and formats (e.g., social media, text alerts, phone calls). (SJCOG Phase II Study: Strategy #11).
		Strategy 3.5.3: Keep N95 masks in stock and available as needed for wildfire season and distribute for free to community. (SJCOG Phase II Study: Strategy #36).
		Strategy 3.5.4: Provide free water for active transportation users. (SJCOG Phase II Study: Strategy #38).
	Objective 3.6: Continue to make levee improvements.	Strategy 3.6.1: Continue critical projects in progress by the San Joaquin Area Flood Control Agency (SJAFCA) including the Lower San Joaquin River Phase I Project. (SJCOG Phase II Study: Strategy #22).
		Strategy 3.6.2: Continue SJAFCA Smith Canal Project (currently under construction). (SJCOG Phase II Study: Strategy #20).

		Strategy 3.6.3: Continue critical projects in progress by SJAFCA. Mossdale Tract (Reclamation District 17) area adaptation assessment (SJAFCA and DWR already evaluating options). Flooding here could affect I-5, I-205 and potentially SR-120. Includes portions of Lathrop, Manteca, Stockton, and San Joaquin County. (SJCOG Phase II Study: Strategy #21).
		Strategy 3.6.4: Implement regionally coordinated levee raising projects to ensure the entire system is high enough for future flows. (SJCOG Phase II Study: Strategy #19).
Goal 4: Strengthen and build collaboration and partnerships around climate impacts.	Objective 4.1: Expand SJCOG's role as a source of technical assistance and up-to-date information, guidance, and leadership for county-wide integration of resilience for member agencies, stakeholders, and the public.	Strategy 4.1.1: Develop template language to address climate change impacts via local code updates (building code, zoning code, local ordinances). (SJCOG Phase II Study: Strategy #24).
		Objective 4.1.2: Identify and learn from best practices or projects that other cities/counties are conducting in terms of responses to wildfires, evacuations, flood events, and other hazards. (SJCOG Phase II Study: Strategy #23).
	Objective 4.2: Improve coordination across stakeholders and local governments.	Strategy 4.2.1: Join/create a Regional Climate Collaborative or committee to coordinate and implement responses to climate change. Cross-sector collaboration would include public health, community-based organizations (CBOs), Climate Action Corps, and private sector. (SJCOG Phase II Study: Strategy #31)
Goal 5: Identify and create additional adaptation funding and staff resource opportunities.	Objective 5.1: Increase and identify funding opportunities for vulnerability assessments and adaptation.	Strategy 5.1.1: Develop dedicated funding to support regional climate change work including implementation of adaptation strategies. Existing funding sources need to be more flexible for adaptation projects. (SJCOG Phase II Study: Strategy #29).

	Objective 5.2: Identify additional staffing resources.	Strategy 5.2.1: Provide outreach funding, such as stipends for volunteers, students, or other professionals to participate in meetings. Providing incentives to contribute will ensure a diverse range of perspectives. (SJCOG Phase II Study: Strategy #33).

APPENDIX E – CLIMATE RESILIENCE METRICS FOR 2022 RTP/SCS PROJECT EVALUATION

SJCOG is currently considering inclusion of a matrix to evaluate the overall RTP project list with metrics from SB1 studies. This would allow SJCOG to evaluate all projects across a variety of funding sources, including some which may already have climate resilience criteria built in.

This document suggests potential metrics to help evaluate how individual projects contribute to the resilience of the region's transportation system and communities. We have included a few different options for metrics. The first one is aspirational in that it requires more analysis and time to estimate for each project but also tends to be more helpful for differentiating between projects and informing decisions. The additional options, the simplified cost metrics and process metrics, take less effort to develop and are more realistic to implement in the short-term, but they are not as informative for decision making.

ASPIRATIONAL COST METRICS

Potential aspirational metrics for evaluating climate resilience are:

- Net savings (or loss) in hazard-related costs due to project: physical damage costs (expressed as discounted present value dollars)
- Net savings (or loss) in hazard-related costs due to project: user costs (expressed as discounted present value dollars)
- Net savings (or loss) in hazard-related costs due to project: user costs for S.B. 535 Disadvantaged Communities members (expressed as discounted present value dollars)

These metrics are intended to quantify, in specific terms, how a project helps address (or worsens) climate-related risk. Each of the metrics should be expressed in discounted present dollars and should capture avoided costs over the entire lifecycle of the project (e.g., now until 2070, or now until 2100). Discounting helps account for differences in costs borne today versus farther into the future. Each of the metrics can account for multiple hazards (e.g., flooding, fire, heat) or just a single hazard. Because they express costs in monetary terms, costs can be simply tallied across hazard types for any given project.

All three metrics compare hazard-related costs without the project (i.e., base case) and with the project. Each metric captures a hazard-related cost with the project minus the hazard-related cost without the project. Projects that reduce costs compared to the base case will score better on these metrics. Projects that increase costs compared to the base case will score worse.

Each of the three metrics expresses a different type of hazard-related cost.

The physical damage costs metric refers to replacement, repair, or maintenance costs caused by hazard(s) (e.g., flood related damages an old, undersized steam crossing that are avoided because a new bridge is installed).

The user costs can include several different types of impacts, such as delay and fuel costs to travelers needing to take detour routes or alternative travel modes during a hazard event. They can also include safety-related impacts such as avoided (or increased) injuries or fatalities or environmental impacts such as avoided (or increased) GHG emissions or local air pollution due to additional travel. While sometimes challenging to monetize, the advantage of monetizing these costs is it enables comparing different types of impacts.

The user cost savings for Disadvantaged Community members metric is like the overall user cost savings metric but focuses more on resilience-related benefits for communities that are likely to be disproportionately affected by hazard events. This definition can be applied to different subsets of the population too, such as transit-dependent individuals or low-income households.

All three of these metrics can be divided by the cost of the project to obtain a benefit cost ratio (BCR).

These metrics are often calculated under several different future climate scenarios. For example, a project could have avoided costs estimated under 'high', 'medium', and 'low' scenarios.

These metrics all require understanding "do-nothing" costs due to current and future climate at a project location. This can require a certain level of data availability and analysis regarding both probabilities and consequence of extreme events, though more resources are becoming available to do this. After developing do-nothing costs, an analysis is performed to determine which of these costs a project is expected to avoid now and into the coming decades. Because of the data and analysis required to develop these metrics, we refer to them as aspirational metrics.

ADDITIONAL OPTIONS

SIMPLIFIED COST METRICS

If it is not yet practical to implement these do-nothing cost metrics, one option would be to make the metrics categorical using cost ranges (e.g., $0-$10,000 avoided costs, $10,000-$100,000 avoided costs, $100,000+ avoided costs). This would reduce the precision of the metric and make it harder to distinguish projects from the perspective of resilience alone. But it would still enable some consideration of increased resilience in the project evaluation process.

PROCESS METRICS

Potential process-oriented metrics for climate resilience are:

- Project design explicitly accounts for current and future climate conditions
- Project intended to significantly reduce risk from climate-related hazard (e.g., flooding, heatwaves, fire)
- Project intended to significantly reduce risk to S.B. 535 Disadvantaged Community members from climate-related hazard

In the absence of information and analysis demonstrating the risk reduced by individual projects, these process-oriented metrics can provide some relative differentiation among projects. Each of these metrics is categorical and could either be used on a Yes/No scale or a Yes/Somewhat/No scale. These metrics tend to be more subjective and open to interpretation. But they are simpler to implement and at least enable some consideration of climate risk in the project evaluation process.

The first metric checks that current and future climate conditions were considered in project planning and design. While accounting for future conditions does not guarantee that a project will enhance the resilience of the system, it does make it more likely that the project will enhance resilience or at least have some justification that incorporates future conditions.

The second and third metrics evaluate a project's purpose – whether it is explicitly intended to address risk from some type of climate-related hazard. The third metric evaluates whether this risk reduction applies to Disadvantaged Community members. Both are relatively subjective but are intended to capture whether resilience is a core feature of projects. They will not do as well capturing projects whose main purpose is something other than resilience but that nonetheless significantly enhance the resilience of the system.

NEXT STEPS

SJCOG can discuss these potential metrics internally. Depending on those discussions, a subset of the metrics can be chosen and incorporated into the project evaluation process.

APPENDIX F – PROJECT MANAGER CLIMATE CHANGE CHECKLIST

Climate resilience is the ability or capacity to prepare for and adapt to changing climate conditions to withstand, respond to, and quickly recover from disruptions. Based on future climate projections considered in the SJCOG Regional Resiliency Implementation Plan, the region is at risk of experiencing rising temperatures; flooding driven by changing precipitation patterns, fluvial/riverine inflows and, in tidally influenced locations, sea level rise and storm surge; and, in some areas, indirect or direct wildfire impacts. Current and future conditions can directly affect transportation systems and assets owned by jurisdictions in the San Joaquin region, and both directly and indirectly affect transportation users.

To prepare the region's transportation infrastructure for future conditions and make sure that it can withstand and rebound from the effects of climate hazards, project managers must integrate climate resilience considerations and an understanding of future climate conditions into project planning and design. The purpose of this checklist is to guide project managers through key climate change-related considerations when planning and designing projects with the goal of improving the resilience of future transportation projects and the region.

Climate Change Considerations Checklist	
Flooding (Fluvial/riverine flows, sea level rise, precipitation events)	
Overview	Increased future flood risk is expected to be driven by changing heavy precipitation patterns, storm surge, and, in tidally influenced areas, sea level rise. These changes can affect fluvial, pluvial, and coastal flood risk. Possible impacts include overtopping and/or inundation of structures, structural damage, water-related damage to electrical and other equipment, and erosion, including scour. Flooding can impact service, damage infrastructure and other property, and present a safety risk to system users and workers. Large-scale flood events can require evacuation.
Planning/Design Considerations	Evaluate whether the project could be affected by flooding, including flooding from tidally influenced water bodies.
	Identify all relevant project design criteria and standards related to flood risks.
	If project is exposed and susceptible to flooding, gather relevant climate data to assess performance against design criteria. This should include both observed (historic) climate data and on future climate projections from downscaled Global Climate Models (GCMs). Specific types of future climate data could include: • Future heavy precipitation projections for the project's drainage area. • For drainage areas that experience wildfire, future wildfire projections. • For drainage areas that experience snowfall, future temperature, and runoff projections. • For tidally influenced projects, future SLR and associated total water levels and, if available, erosion projections. Each of these datasets can feed into the hydrologic analysis that is typically done as part of project design. Note that in some cases, particularly for larger rivers, there may be future streamflow projections available as well, which may already account for future precipitation, snowfall/melt patterns and/or wildfire patterns.

	Select 2-3 future climate scenarios for analysis, including a highly likely scenario and a higher-impact/lower-likelihood scenario.
	Perform hydrology and hydraulics (H&H) for project that includes future climate scenarios in addition to historical/observed conditions. For drainage areas affected by wildfires, account for flow increases to due burn scarring and debris flow.
	Evaluate whether the project (through review of the relevant project design criteria, standards, and drawings) meets the flood-related design standards defined in law, regulation, and code. This should be done for each scenario.
	Understand and document consequences if the design requirements are exceeded.
	Identify impacts to users in event of project disruption or failure. This includes vulnerable communities/populations in the project footprint and/or served by the project who may be affected by current or future flood risks.
	Determine if additional protection or other strategies (i.e., adaptation options) might be needed to address the flood risk and ensure the project meets design standards. Where feasible, choose flexible strategies that can be adjusted over time. Strategies should also align with regional and State goals, including equity, mobility, GHG mitigation, and ecosystem health. If helpful, perform an assessment of life-cycle flood-related costs under the different scenarios for the different options. This will help determine cost effectiveness. Based on the information gathered, evaluate the strategies, and determine the most appropriate one for implementation.
O&M Considerations	Integrate O&M strategies that address potential future disruptions into applicable plans, standard operating procedures (SOPs), manuals, and training materials. This should include planning for and/or facilitating evacuations due to flood events.
	Identify how project should be monitored to track and adjust system performance as conditions change over time.
Wildfire	
Overview	Current and future wildfire risk can pose direct risks to transportation infrastructure, such as damaging equipment and other infrastructure. Wildfires can require evacuation, making the transportation an invaluable lifeline. The secondary impacts of wildfires on flood risks should also be considered; this topic is covered in the flooding checklist preceding this one.
Planning/Design Considerations	Evaluate whether the project could be affected by wildfire.

	Identify all relevant design and safety standards related to wildfire.
	If project is exposed and susceptible to wildfire, gather relevant climate data to assess performance against design criteria. This should include both observed (historic) climate data and on future climate projections from downscaled Global Climate Models (GCMs). Select 2-3 future climate scenarios for analysis, including a highly likely scenario and a higher-impact/lower-likelihood scenario.
	Evaluate whether the project (through review of the relevant project design criteria, standards, and drawings) meets the fire-related design and safety standards defined in law, regulation, and code. This should be done for each scenario. This includes provision of defensible space around assets.
	Understand and document consequences if the design requirements are exceeded.
	Identify impacts to users in event of project disruption or failure. This includes vulnerable communities/populations in the project footprint and/or served by the project who may be affected by current or future wildfire risks.
	Determine if additional protection or other strategies (i.e., adaptation options) might be needed to address the wildfire risk and ensure the project meets design/safety standards. Where feasible, choose flexible strategies that can be adjusted over time. Strategies should also align with regional and State goals, including equity, mobility, GHG mitigation, and ecosystem health. Based on the information gathered, evaluate the strategies, and determine the most appropriate one for implementation.
O&M Considerations	Integrate O&M strategies that address potential future disruptions into applicable plans, standard operating procedures (SOPs), manuals, and training materials. This should include planning for and/or facilitating evacuations due to wildfire events.
	Identify where the project will integrate data or monitoring systems to track and adjust system performance as conditions change over time.
	Evaluate project could be affected by fire-related power outages (either unplanned or planned, such as Public Safety Power Shutoffs). Where feasible, create strategies that enable continued operation of the project during a power outage.
	If applicable, evaluate whether selected landscaping and vegetation will be effective under future wildfire conditions.
Extreme heat (equipment, power outages, heat and passenger comfort, heat and rail stress, pavement stress)	
Overview	Future extreme heat and humidity can adversely affect performance of and damage mechanical, electrical, and communications equipment. Buildings, transit stations, and other infrastructure rely

	on mechanical, electrical, and communications equipment that could be susceptible to future heat risk. Increased temperatures can impact human health and may disproportionately impact vulnerable communities and transit-riders. Possible impacts of increased temperatures include direct impacts like heat stress and heat-related illnesses, and indirect impacts like reduced accessibility to transit and increased localized air pollution. Changing high and low temperature conditions can stress continuous welded rail, leading to buckling or cracking. Similarly, changing temperatures can result in damage to pavement/asphalt.
Planning/Design Considerations	Evaluate whether the project could be affected by extreme heat.
	Identify all relevant design standards related to high heat, including for electrical equipment.
	If project is susceptible to extreme heat, gather relevant climate data to assess performance against design criteria. This should include both observed (historic) climate data and on future climate projections from downscaled Global Climate Models (GCMs). Select 2-3 future climate scenarios for analysis, including a highly likely scenario and a higher-impact/lower-likelihood scenario.
	Evaluate whether the project (through review of the relevant project design criteria, standards, and drawings) meets the heat-related design standards defined in law, regulation, and code. This should be done for each scenario.
	Understand and document consequences if the design requirements are exceeded.
	Identify impacts to users in event of project disruption or failure. This includes vulnerable communities/populations in the project footprint and/or served by the project who may be affected by current or future extreme heat. This should include passenger health and comfort for transit projects or active transportation projects.
	Determine if additional protection or other strategies (i.e., adaptation options) might be needed to address the heat risk and ensure the project meets design standards. Where feasible, choose flexible strategies that can be adjusted over time. Strategies should also align with regional and State goals, including equity, mobility, GHG mitigation, and ecosystem health. If helpful, perform an assessment of life-cycle heat-related costs under the different scenarios for the different options. This will help determine cost effectiveness. Based on the information gathered, evaluate the strategies, and determine the most appropriate one for implementation.
O&M Considerations	Integrate O&M strategies that address potential future disruptions into applicable plans, standard operating procedures (SOPs), manuals, and training materials.

	Identify where the project will integrate data or monitoring systems to track and adjust system performance as conditions change over time.
	Evaluate whether current and future temperatures could adversely impact workers and mitigate impacts.
	For projects including asphalt pavement, evaluate whether current and future temperatures could require changing pavement binder grade.
	For rail projects, identify when the rail neutral temperature (i.e., zero stress temperature) will change based on changing temperature conditions and ensure rail is re-stressed accordingly.
	If applicable, evaluate whether selected landscaping and vegetation will be effective under future temperature conditions.